RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

PUBLISHED BY THE RADIOLOGICAL SOCIETY OF NORTH AMERICA

VOL. XVI JANUARY, 1931 No. 1

RECENT PROGRESS IN X-RAY STANDARDIZATION[1]

By LAURISTON S. TAYLOR, Bureau of Standards, WASHINGTON, D. C.

Abstract.—Advances made in the measurement of X-ray quantity or intensity during the last three years are reviewed. A comparison of the cylindrical and parallel-plate types of air ionization chamber indicates that the latter is better suited for accurately determining the roentgen. The smaller guarded field parallel-plate ionization chamber is free of all the defects of both larger types of chamber. Preference is given to the null electrostatic current measuring system when covering a wide range of sensitivities and to eliminate field distortion. For routine and secondary standardization measurements the current compensation scheme, using the radium ionization chamber, is more satisfactory. A comparison of various diaphragm systems indicates the necessity of a diaphragm close to the tube to eliminate off-focus and stem radiation. For quality measurements the effective wave length method, using thin (0.25 mm.) copper absorption screens, is recommended.

I. INTRODUCTION

AT the Second International Congress of Radiology, held in Stockholm in July, 1928, the Committee on the Standardization of X-ray Measurements tentatively adopted as the unit of X-ray quantity the ionization produced by X-rays in air under standard conditions.[2] The recommendations of the Committee are:

"1. That an International Unit of X-radiation be adopted.

"2. That this International Unit be the quantity of X-radiation which, when the secondary electrons are fully utilized and the wall effect of the chamber is avoided, produces in one cubic centimeter of atmospheric air at 0° C. and 76 cm. mercury pressure, such a degree of conductivity that one electrostatic unit of charge is measured at saturation current.

"3. That the International Unit of X-radiation be called the 'roentgen' and that it be designated by the letter small 'r'.

"4. That various standard methods be employed to establish the unit.

"5. That for all comparative purposes it is advisable to employ ionization chambers which have been calibrated in terms of a standard chamber for X-radiation of the various qualities employed. It is also advisable to make the wall effects of these chambers as small as possible.

"6. That the practical instrument used to measure X-ray output be called a dosage meter (Dosismesser, dosimètre).

"7. That the constancy of the indications of the dosage meter be tested by means of gamma radiation emitted from a definite quantity of radium element, the measurement being carried out always under the same conditions.

"8. That any specification of dosage is incomplete without specifying the quality as well as the quantity of the radiation. The quality of X-radiation used for practical purposes is very varied and it would be impracticable to give a complete specification of it; but much information can be obtained from a knowledge

[1]Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.
[2]RADIOLOGY, October, 1929, XIII, 372.

of the degree of absorption of the radiation in standard materials, the peak voltage applied to the tube, together with the filter employed, and the general character of the high tension apparatus.

"For practical purposes the quality may be expressed by stating the half value layer in a suitable material, or by stating the effective wave length as determined by the percentage amount of radiation transmitted through a given thickness of a suitable material (copper or aluminum).

"In view of the fact that rapid progress is being made in methods of X-ray measurement and in our knowledge of X-ray phenomena the Committee feels that the above recommendations should be regarded as being of a provisional character."

It was recognized at the time that our knowledge of the use of a standard air ionization chamber had not yet reached an entirely satisfactory state, consequently no definite stipulations were made regarding details required in the determination of the roentgen (r). Since this last Congress, however, various workers have carried out independent investigations, with the result that many questions which were previously uncertain now appear to be satisfactorily solved. It seems opportune, therefore, to summarize and compare, where possible, the results of the various investigations, showing how they may be incorporated into an apparently satisfactory system for an unambiguous determination of the international roentgen.

As opposed to the types mentioned, Solomon[3] still advocates the use of a thimble chamber, standardized with the gamma rays of radium, as a primary standard. He stipulates, however, that the thimble chamber measurements be independent of the wave length of the radiation — a requirement which defeats its purpose when considering a choice between the thimble chamber and the free air ionization chamber, for only by comparison of the former against the latter can assurance of such an independence of wave length be obtained.

As the principal basis of his continued advocacy of the thimble chamber standard, Solomon refers to a statement by Failla at Stockholm,[4] that free air ionization chambers give results which differ by as much as 300 per cent. However, this appears to be a misunderstanding on Solomon's part of Failla's results. The difference obtained by Failla referred to measurements with a correctly designed chamber and diaphragm system on the one hand and a given, obviously incorrectly designed chamber and diaphragm system on the other. Contrary to Solomon's contention, Failla's results indicate that, with proper design, a free air chamber should yield a very accurate measurement of the roentgen.

Another type of primary standard is being investigated by Rajewsky.[5] This is a spherical thimble chamber, but its primary calibration against Ra gamma radiation is so devised as to be independent of the distance between the Ra source and the chamber. If this can be accomplished simply and unambiguously, there may be many factors favoring its use.

The inherent difficulty with Solomon's method lies in the comparatively large number of geometrical requirements involved in the radium calibration,[6] a very small error in any of which will cause a relatively large error in the final result. Behnken,[7] Glasser[8] and others have evaluated Solomon's unit in terms of the roentgen and their publications show clearly the difficulties involved. Rajewsky's method, if successful, would avoid most of these.

---

[3]I. Solomon, Bull. et Mém. de la Soc. Rad. Méd. de France, 1929, XVII, 45.

[4]G. Failla. Paper read at Second Internat. Cong. Rad., July, 1928. See Am. Jour. Roentgenol. and Rad. Ther., January, 1929, XXI, 47.

[5]B. Rajewsky, Strahlentherapie, 1928, XXX, 555.

[6]I. Solomon, Jour. de Rad. et d'Elec., 1924, VIII, 851; 1926, p. 155; 1927, XI, 286.

[7]H. Behnken, Strahlentherapie, 1928, XXIX, 192.

[8]O. Glasser, Jour. de Rad. et d'Elec., 1928, XII, 421.

II. THE FREE AIR IONIZATION CHAMBER

1. *Cylindrical type of chamber*

At present two principal types of free air ionization chamber are in general use—the cylindrical form used by Behnken[9] and the parallel-plate form used in France (by Dauvillier),[10] England, and this country. Until 1928 Behnken used a cylindrical pressure air chamber but has since changed to the simpler atmospheric pressure chamber commonly used elsewhere.

Behnken[11, 12] has published extensive studies of the pressure chamber characteristics; but, until the very recent work by Schlechtmann[13] in Moscow, there has been no complete and critical study of the atmospheric pressure form of cylindrical air chamber. From Schlechtmann's work we are led to believe that the performance of such a chamber is not quite as simple as heretofore assumed.

He finds that, to secure a proper electrostatic field within the chamber, the chamber ends must be fixed at an empirically determined potential somewhat lower than the saturation potential. He also finds that the saturation potential depends upon the area of the beam entering the chamber, although he again avoids any consequent difficulty by applying a potential to the ends. This can probably be accounted for by the fact that in a cylindrical chamber the potential gradient increases from the outer to the inner electrode. If the potential be adjusted for saturation with an entering beam of small divergence, there is no assurance that there will be saturation for the same beam if very divergent, because different portions traverse different fields.

Moreover, if in such a chamber the outer ends of the guard electrodes extend very close to the chamber end (which is maintained at the saturation voltage), large field distortion results between the guard and the end. To avoid the effect, at the chamber center, of such distortion, the guards must be very much longer than in the case where they terminate at a distance from the chamber ends equal to the separation between the collector and the surrounding cylinder.

The Küstner[14] cylindrical chamber is not suited to absolute measurements of the roentgen because its construction does not avoid field distortion. It is, however, well suited for comparative purposes, as used, for example, in Schlechtmann's work.

2. *Parallel-plate type of chamber*

In the parallel-plate ionization chamber some of the difficulties encountered with the cylindrical chamber are avoided, provided certain well-established geometrical factors are taken into consideration.

Various investigators have determined empirically that, for a *very narrow beam* of radiation, a plate spacing of about 10 cm. is sufficient to insure complete utilization of the photo-electrons ejected by 200 kilovolt X-rays, although theoretically the range of such photo-electrons in air is several times this spacing. However, the path of a photo-electron is very crooked, so that the probability of one striking the plate 5 cm. away is exceedingly small, as first shown by Holthusen.[15]

The fact that the distribution of photo-electrons is different in the forward and backward direction, does not affect the effective volume of air ionized, provided the quality of the radiation does not vary appreciably over the length of the collector

[9] H. Behnken, Strahlentherapie, 1928, XXVI, 79.

[10] A. Dauvillier, Bull. et Mém. de la Soc. Rad. Méd. de France, 1929, XVII, 148.

[11] H. Behnken, Ztschr. f. Tech. Phys., 1924, V, 3.

[12] H. Behnken and R. Jaeger, Ztschr. f. Tech. Phys., 1926, VII, 563.

[13] J. Schlechtmann, Ann. der Physik, 1930, V, 153.

[14] H. Küstner, Strahlentherapie, 1928, XXVII, 231.

[15] H. Holthusen, Fortschr. a. d. Geb. d. Röntgenstr., 1919, XXVI, 211.

electrode. It is possible that in a very long chamber, such as used by Chamberlain and Newell,[16] this may introduce a very small error.

The first practical form of parallel-plate chamber was constructed by Duane.[17] It was subject to error from two principal causes—field distortion at the diaphragm end and insufficient plate spacing for high voltage radiation. Duane and Lorenz[18] have since modified the chamber to eliminate these errors. To avoid field distortion at the collector, they find that the lead diaphragm for restricting the beam must be kept at the right potential. Their use of a galvanometer to measure the ionization current requires a relatively large diaphragm area. Taylor[19] has shown that this may introduce an error in the effective air volume unless the chamber is placed sufficiently far from the X-ray tube. They also use their chamber without any surrounding case for electrostatic shielding, which is practicable only under exceptional laboratory conditions. There appears to be no apparent reason, however, why such shielding should not be used if circumstances demand.

Glasser and Portmann[20] in their original form of standard chamber did not allow sufficient spacing between the electrodes and the surrounding box, although the probable field distortion was not large. An indirect check between their standard and the Bureau of Standards[21] chamber showed a difference of about 3 per cent which, under the circumstances, may be considered quite satisfactory.

Failla[22] has reported one of the most complete studies of the design of the standard chamber and his results have been checked in detail independently by the less elaborate studies of Taylor,[23] which were conducted at about the same time.

The latter found that the guard plate width should be at least 1.5 times the spacing between the high potential and grounded plates. If Failla's data on the distribution of uniform electrostatic field between the chamber electrodes for a fixed chamber length be plotted, his results may be compared with Taylor's. The resulting curve (Fig. 1) gives the maximum width of uniform field as a function of the plate spacing for a fixed overall plate length of 42 centimeters. To apply Failla's results we may take, as an example, a plate spacing of 10 cm. (A on the curve), for which we find a central uniform field 12 cm. wide, leaving 30 cm. for the two guard plates (15 cm. wide, each), which is exactly 1.5 times the plate separation. This shows perfect agreement between Failla's and Taylor's criteria.

By further application of Failla's curve to Glasser and Portmann's chamber, we find for their chamber length of 26.98 cm., a 10 cm. plate separation and a 5 cm. (approximately) collector width, only about 11 cm. remaining for the width of each guard plate. Failla's results indicate that 15 cm. is the minimum permissible width; we should, therefore, expect a small amount of field distortion in Glasser and Portmann's chamber.

Dauvillier[24] has also adopted a parallel-plate chamber, but his studies of the design have brought out no new features.

More recently Kaye and Binks[25] have described a standard chamber similar to the older Duane type,[26] designed, however, only for radiation up to 100 kilovolts. Conse-

[16]W. E. Chamberlain and R. R. Newell, Am. Jour. Roentgenol. and Rad. Ther., December, 1924, XII, 509.

[17]W. Duane, Am. Jour. Roentgenol., 1922, IX, 467.

[18]W. Duane and E. Lorenz, Am. Jour. Roentgenol. and Rad. Ther., 1928, XIX, 461.

[19]L. S. Taylor, Bureau of Standards Jour. Research, 1929, III (R. P. 169), 807; RADIOLOGY, July, 1930, XV, 49.

[20]O. Glasser and U. V. Portmann, Am. Jour. Roentgenol. and Rad. Ther., 1928, XIX, 47.

[21]A report of this work will be published in Bureau of Standards Jour. Research in conjunction with future calibrations of dosage meters.

[22]G. Failla, Am. Jour. Roentgenol. and Rad. Ther., January, 1929, XXI, 47.

[23]L. S. Taylor, Bureau of Standards Jour. Research, 1929, II (R. P. 56), 771.

[24]A. Dauvillier. See Footnote 10.

[25]G. W. C. Kaye and W. Binks, Brit. Jour. Radiol., 1929, II, 553.

[26]W. Duane, Am. Jour. Roentgenol., 1922, IX, 467.

quently their plate separation of only 5 cm. may be sufficient as indicated by their measurements. However, they assume that the range of 100 kilovolt photo-electrons in air is only 1.5 cm., which is not in good agreement with C. T. R. Wilson's[27] results, which give a 1 cm. range to a 21 kilovolt electron in moist air. It may be that their electrometer system was not sufficiently sensitive to measure the small percentage of photo-electrons which reached the collector plate.

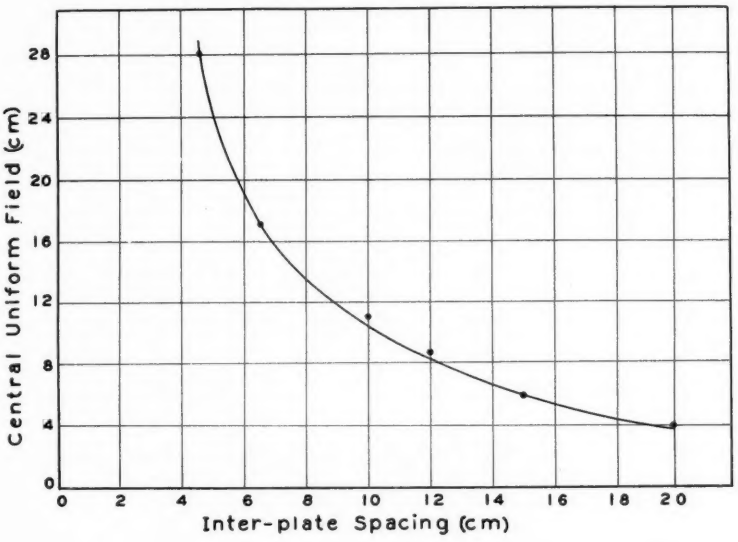


Fig. 1. Curve from Failla's data giving the width of uniform central field in a parallel plate ionization chamber as a function of the plate separation (overall plate length parallel to beam is 42 centimeters).

Applying Failla's conclusions to Kaye and Binks' guard plates, we find that they are only about two-thirds the necessary minimum width, so that some field distortion may be expected. Moreover, it is found that their plate system is too close to the grounded case, as indicated by Taylor's results as well as Failla's.

In the chambers used by Duane, and Duane and Lorenz,[28] the collector electrode is surrounded by a guard plate on all sides. Likewise, Kaye and Binks have employed such a guard system. Measurements made by Taylor have indicated that there is no necessity for such a construction, provided the guards and collector are sufficiently long (in a direction perpendicular to the beam), whereas such an arrangement presents greater difficulties in construction and proper insulation than does the plate system used by Glasser, Failla, Taylor and others. The presence or lack of a completely surrounding guard has no effect on the ionization measurements.

The large parallel-plate chamber designed by Taylor[29] fulfills all the criteria given by Failla. For a plate spacing of 10–12 cm., the guard plate width is 20 cm., thus allowing an appreciable safety factor over the width obtained from Failla's curve. In addition, the plate system is spaced from the

[27]C. T. R. Wilson, Proc. Roy. Soc., 1923, CIV, 1.
[28]See Footnotes 17 and 18.

[29]L. S. Taylor, Bureau of Standards Jour. Research, 1929, II (R. P. 56), 771; RADIOLOGY, April, 1930, XIV, 372.

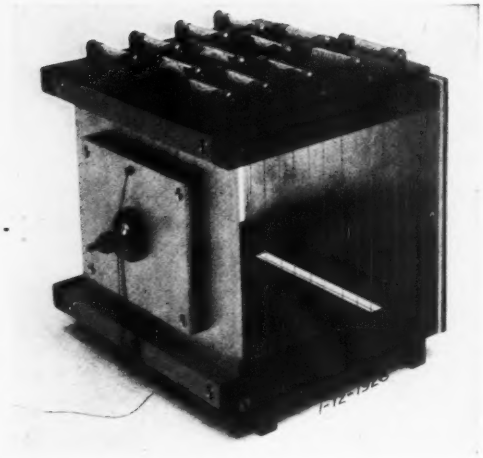


Fig. 2. Guarded field electrodes for standard ionization chamber of Taylor and Singer.

box by a distance equal to the plate separation, thus minimizing field distortion at the plate ends. This likewise eliminates the effect reported by Duane and Lorenz,[30] which requires that the entrant diaphragm be maintained at high potential. Failla[31] also found that suitable spacing from the box eliminated this effect.

This chamber is found to have none of the inherent defects discussed thus far. The complete chamber is consequently very large, and, with its surrounding shield of 1/8 inch lead, is very heavy. It is believed, however, that a precise determination of r will not permit of further reduction.

A much more convenient form of parallel-plate chamber has recently been described by Taylor and Singer.[32] In this, end field correction is provided by means of a system of guard wires extending all around the chamber in a series of planes parallel to the plate, as shown in Figures 2 and 3. Calculations by Snow[33] indicate that, with the total potential across the chamber divided in equal steps on successive guard wires, the field 1 cm. inside the chamber should be uniform to within a very small percentage. As a consequence we are able by this arrangement to reduce the guard plates from a width of 20 cm. to 5 cm., and, likewise, the height of the plates from 25 cm. to 10 centimeters. Furthermore, since external field distortion cannot penetrate the guard wire system, the enclosing box need be spaced only 2 cm. from the plate system in any dimension.

By this method the difficulties noted above are entirely eliminated and the complete chamber is only about 16 cm. on a side as compared to 40×70 cm. for the large chamber. A careful experimental comparison with the large chamber[34] shows agreement between the two within the limits of error of observation (about 0.4 per cent).

One of the outstanding advantages of this type of chamber is that it permits of the minimum distance between diaphragm and collector. This is particularly important if a single ionization chamber is to cover the wide range of X-ray qualities encountered in practice. A loss of intensity of several per cent has been found by Taylor to occur between the diaphragm and collector for some of the usual types of large air ionization chambers. In the guarded field chamber this distance is only about 10 cm., and consequently the effect of air absorption is minimized.

In addition, the collector plate is only 5 cm. wide, so that there will be a minimum change in X-ray quality, due to air absorption over its width. This also is essential in the computation of the effective volume of air ionized.

3. Material of standard chamber electrodes

Theoretically the plates of a chamber should be made of some material, such as

[30] W. Duane and E. Lorenz, Am. Jour. Roentgenol. and Rad. Ther., 1928, XIX, 461.

[31] G. Failla, Am. Jour. Roentgenol. and Rad. Ther., 1929, XXI, 47.

[32] L. S. Taylor and G. Singer, Bureau of Standards Jour. Research, 1930, V (R. P. 211), 507; RADIOLOGY, December, 1930, XV, 637.

[33] C. Snow, Bureau of Standards Jour. Research, 1928, I (R. P. 17), 513.

[34] L. S. Taylor and G. Singer. See Footnote 32.

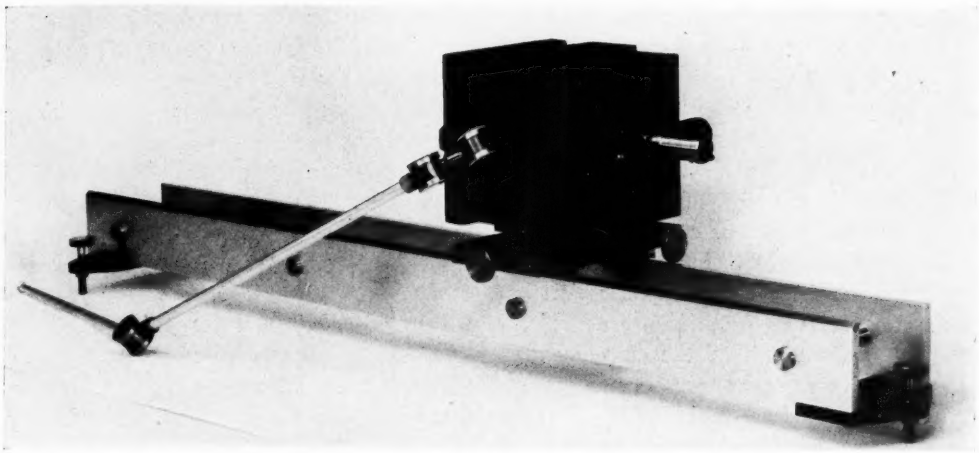


Fig. 3. Complete guarded field standard ionization chamber showing four-foot bench and electrometer leads.

suggested by Fricke and Glasser,[35] which has the same effective atomic number as air. This is based on the fact that, when X-rays scattered by air strike such a wall, photo-electrons of the same general velocity distribution will be ejected, thus producing the same ionization effect as if air actually replaced the plates.

It has been the practice of many observers to coat the electrode surfaces with a graphite paint or its equivalent. However, it is doubtful if such a procedure is of great advantage, since scattered radiation can penetrate such a thin layer and then eject photo-electrons from the plate, which is what we wish to avoid in the first place. Moreover, we cannot consider an "air wall" plate as truly the equivalent of air when used in such a manner, because by so doing we must neglect the photo-electrons which are ejected in a forward direction into the wall and are therefore lost as far as their ionizing is concerned.

Duane and Lorenz[36] have made measurements of the ionization in a chamber, the plates of which were painted with a graphite mixture, and found a negligible difference as compared with the unpainted plates of aluminum, but a small difference between brass and aluminum electrodes. Behnken[37] uses a cylindrical chamber painted with graphite, and Kaye's chamber[38] is lined with 3 mm. graphite sheets. Measurements made by the author with a chamber having sheet graphite plates agreed within the limits of error with those of a chamber having aluminum plates.

Moreover, with a diaphragm system properly designed so as to prevent diaphragm scattering, a negligible amount of air-scattered radiation should be incident on the plates. To test this in the larger chamber used by Taylor, a photographic plate wrapped with lead wire was placed next to the collector plate for 15 minutes while an X-ray beam passed through the chamber. Not the slightest shadow of the wire was visible on the plate after development, thus bearing out the contention above.

It appears conclusive, therefore, that un-

[35]H. Fricke and O. Glasser, Am. Jour. Roentgenol. and Rad. Ther., 1925, XIII, 462.

[36]W. Duane and E. Lorenz. See Footnote 18.

[37]H. Behnken, Strahlentherapie, 1928, XXVI, 79.

[38]G. W. C. Kaye and W. Binks. See Footnote 25.

painted aluminum is a satisfactory plate material for use in a standard chamber.

III. METHODS FOR MEASURING IONIZATION CURRENT

In the early use of the free air ionization chamber most observers overlooked the importance of field distortion. We have seen in Section II how plate end distortion has been dealt with so as to insure a uniform field over the width of the collector electrode, but it was apparently not until the recent work of Failla[39] and Taylor[40] that the full importance of field distortion at the region between the guards and collector electrode was realized.

Current measuring methods involving the deflection electroscope invariably set up large disturbing potential differences between guard and collector; and, since the guard plate widths are usually so fixed as to just provide uniform field at the collector, a small disturbance, due to a potential difference between guard and collector, may upset the originally uniform field. The effect of such a disturbance has been investigated by Taylor[41] and found to be unduly large.

Glasser and Portmann,[42] and Behnken,[43] suspecting some such effect, allowed the electroscope to discharge between potentials equally above and below that of the guards, assuming that the field distortions would be equal and opposite in effect. Taylor has shown, however, that such an assumption is not justified, for the net distortion was sufficiently large to demand elimination. More recently Kaye and Binks[44] have investigated this effect, finding it negligible. They employed, however, a deflection method in this study, whereas Taylor used a null method where all potentials remained constant, so the effect in their case may have been masked by the method of current measurement. On duplicating Glasser's conditions, as nearly as possible, Taylor found the effect to be quite pronounced. It would thus seem desirable to have Kaye and Binks' work repeated, using a null method.

Behnken's[45] later method of ionization current determination, by measuring the potential drop across a very high resistance (10^9 ohms) with a quadrant electrometer, maintains the collector at essentially zero potential, hence should be quite satisfactory, provided the high resistance remains constant.

Duane[46] employs a d'Arsonval galvanometer of very high sensitivity to measure his ionization currents. This again is satisfactory except that the limited sensitivity of the galvanometer prevents measurements with sufficient accuracy of weak or very highly filtered radiation. It also necessitates the use of large diaphragms, which is satisfactory only if special precautions are taken.

To eliminate the difficulties mentioned, Failla[47] and Taylor[48] independently devised sensitive null indicating electrostatic measuring methods which each used successfully for over a year before publication. Most other investigators have since adopted some such method; Dauvillier[49] most recently has reported its successful use in connection with his chamber.

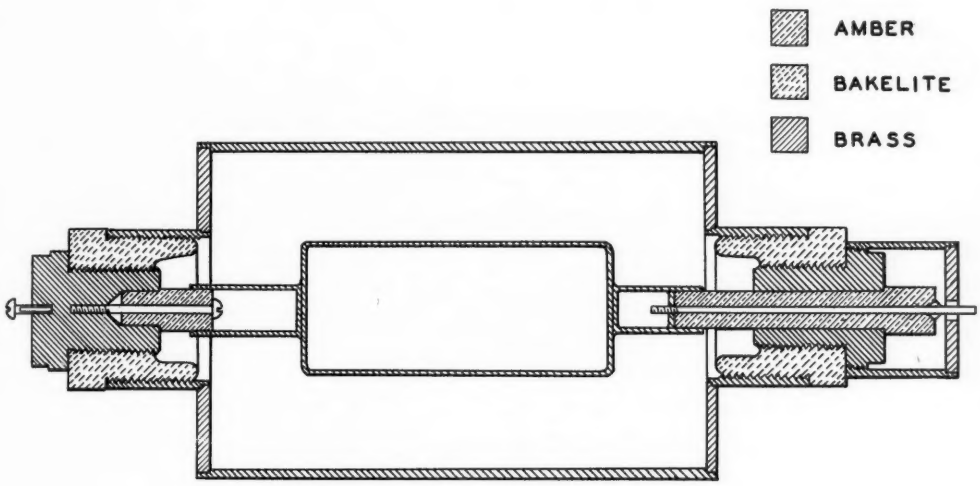
The methods of Taylor and Failla are the same in principle, the former using a variable potential for accomplishing compensation[50] while the latter uses a variable capacitance for compensation. With both of these methods the collector electrode is main-

[39]G. Failla. See Footnote 22.
[40]L. S. Taylor. See Footnote 23.
[41]L. S. Taylor. See Footnote 23.
[42]O. Glasser and U. V. Portmann. See Footnote 20.
[43]H. Behnken. See Footnote 9.
[44]G. W. C. Kaye and W. Binks. See Footnote 25.
[45]H. Behnken. See Footnote 9.
[46]W. Duane, Am. Jour. Roentgenol., 1922, IX, 467.
[47]G. Failla. See Footnote 22.
[48]L. S. Taylor. See Footnote 23.
[49]A. Dauvillier. See Footnote 24.
[50]Compare D. L. Webster and A. E. Henning, Phys. Rev., 1923, XXI, 301.

tained within a small fraction of a volt at the same potential (zero) as the guards, and, consequently, all guard-collector field distortion is effectively eliminated.

These methods have the advantage of a sensitivity range capable of measuring any ionization current encountered in practice. Another practical advantage is the fact that such a method is independent of variations in the electrometer sensitivity—a factor not easily controlled over a long period in the deflection methods.*

Failla[51] has recently developed a D.C. vacuum tube amplifier circuit as a null current detector, which is more sensitive than the electrometer and, in most respects, more convenient to use, since the indicating instrument is an ordinary microammeter. Used in a null circuit, its zero current indications are independent of vacuum tube variations and consequent circuit instability, hence it should be highly satisfactory as an indicator.



FAILLA RADIUM COMPENSATION CHAMBER

Fig. 4. Cross-section of Failla's radium compensator for null electrometer measurements. Inner cylinder is supported rigidly on amber, with a lead passing out to ionization chamber system. Outer cylinder coated on inside with radium preparation.

Another new current compensation scheme has been recently described by Jaeger,[52] who employs a variable source of ionization current of known value to balance against the unknown X-ray ionization current. The equality of the two currents is indicated by a null reading string electrometer. His compensating current source is a saturated uranium oxide variable ionization chamber so constructed that the current is a linear function of the area of uranium oxide exposed.

Failla[53] has developed a different system of current compensation making use also of radio-active material. His source of variable current is a small cylindrical radium

*Note added in proof (Dec. 12, 1930): Since the preparation of this paper, the writer has devised a new method of calibrating and using null electrostatic circuits, which is 5–10 times more accurate than any heretofore used. This circuit is also designed to be independent of lead capacities and does not require insulation better than rubber. A complete description is being prepared.

[51]G. Failla, RADIOLOGY, October, 1930, XV, 437.

[52]R. Jaeger, Strahlentherapie, 1929, XXXIII, 542.

[53]G. Failla. See Footnote 51.

Fig. 5. Photograph of Failla's compensator assembled.

ionization chamber (Figs. 4 and 5), the ionization current in which is regulated by varying the applied voltage. The amount of radium in the chamber is so chosen that a range of a few volts will give currents covering the whole range encountered in practice. The chamber requires a high voltage for saturation, so that the working range lies at the foot of the saturation curve and gives practically a linear relation between voltage and current. This chamber has a distinct advantage over Jaeger's, being hermetically sealed and containing no moving parts the derangement of which would spoil the calibration.

Neither Jaeger's nor Failla's method has any outstanding merit as a primary source of current, as each must be calibrated by some null method as described above. However, the calibration is easy to make and control by means of a single voltage-current measurement for a high current value, by means of a galvanometer. As current-measuring methods of high precision and ease of manipulation they are very satisfactory and are to be particularly recommended for use with secondary standard chambers and clinical ionometers.

IV. DIAPHRAGM SYSTEMS

Until recently most observers have used a more or less arbitrary system of diaphragms for defining the effective area of the X-ray beam entering the standard chamber. It is believed that one of the greatest difficulties in bringing their standards into agreement has been due to this feature.

Behnken[54] was one of the first to show theoretically that the effective volume of air ionized in the free air chamber is given by the product of the area of the chamber diaphragm and the corrected length of the collector electrode. However, he made no extensive attempt to verify his results under widely differing experimental conditions. Many other investigators have likewise accepted them without further verification. Moreover, Behnken's analysis has been found to be correct within certain limiting conditions only.

Experimental studies by Taylor and Singer[55] have brought out the significant fact that, in designing a diaphragm system, we cannot leave out of consideration the fundamental purpose of the standard chamber—that of calibrating secondary chambers, including thimble chambers. They have found that diaphragming conditions must be adjusted to the needs of both types of chamber, which somewhat complicates the problem.

Failla[56] made the first fairly complete experimental study of the diaphragm systems and his final conclusions are rather broad. His method was to vary each of a number of factors, holding all others constant.

Taylor[57] developed first a simple geometrical analysis of diaphragm systems having what appeared to be reasonable restrictions and then conducted experimental studies

---

[54] H. Behnken, Strahlentherapie, 1927, XXVI, 79.

[55] L. S. Taylor and G. Singer, Bureau of Standards Jour. Research, 1929, III (R. P. 169), 807; RADIOLOGY, August, 1930, XV, 227.

[56] G. Failla. See Footnote 22.

[57] L. S. Taylor, Bureau of Standards Jour. Research, 1930, III, 631; RADIOLOGY, July, 1930, XV, 49.

which bore out the validity of the restrictions. Later work by Taylor and Singer[58] took into consideration the calibration of a thimble chamber and the results indicated that the earlier restrictions were not only valid but necessary.

One of the principal points of contention between various observers has been the need for screening off target and stem radiation. Behnken[59] found that this was necessary for proper calibration of a thimble chamber. Failla's[60] results indicate that it is unnecessary and perhaps undesirable, but as yet he has not studied the calibration of a thimble chamber in an unrestricted beam. Glasser has changed his diaphragm system several times without reporting any analytical reasons therefor. We shall review a few of the factors which various studies have brought out.

Taylor[61] first only considered an X-ray beam in which target and stem radiation was completely shielded off. Assuming, then, the focus to be a point source of radiation, the range over which the inverse square law applied was calculated as a function of relative diaphragm distances and areas. An alternative assumption was that the focal spot emitted radiation uniformly (which is experimentally untrue), so that a diaphragm placed close to the X-ray tube should be of such size that the focal spot area filled the aperture of the cone determined by the tube diaphragm and the chamber diaphragm.

Experimental tests of these two assumptions indicated their validity under many different sets of geometrical conditions. The range over which the inverse square law held agreed closely with the predictions. Moreover, the experimental agreement with the second assumption was better than the first by a small factor but within experimental limits.

Failla[62] has given several sets of curves showing the relation between the ionization current and the area of a diaphragm 43 cm. from the tube when the chamber diaphragm was fixed at several different areas, each kept constant during a single run. Taylor obtained a similar curve and showed that the shape was due to the presence of off-focus radiation; the point where the curve flattens out occurs at the correct position on the basis of such considerations. A proposal by Duane was to make the diaphragm nearer the tube conform in area to the geometrical aperture of the chamber diaphragm and the focus, considered as a point. Failla found, however, that this arrangement did not permit the maximum ionization in the chamber—the explanation being that the focus cannot be considered a point and that the off-focus radiation is usually at least 10 per cent that of the focal radiation. His final conclusion is that the two diaphragms should be of about the same size, based on the fact that the ionization in the chamber is proportional to the area of the chamber diaphragm when the other diaphragm is large or absent. This has been checked also by Taylor. However, Taylor and Singer[63] find that this condition may be invalid when considering the correct calibration of a thimble chamber under such conditions.

The most fundamental requirement is that the beam be of uniform intensity over its cross-section within the area subtended by the chamber diaphragm or thimble chamber. Photometric measurements of the diaphragmed beam used in Taylor's[64] work indicate such required uniformity, whereas for a beam unrestricted by diaphragms the uniform area is usually insufficient to completely cover a thimble chamber. It was found, also, that visual alignment of the chamber and diaphragm is not always satis-

[58] L. S. Taylor and G. Singer. See Footnote 55.
[59] H. Behnken. See Footnote 9.
[60] G. Failla. See Footnote 22.
[61] L. S. Taylor. See Footnote 19.
[62] G. Failla. See Footnote 22.
[63] L. S. Taylor and G. Singer, Bureau of Standards Jour. Research, 1929, III, 807; RADIOLOGY, August, 1930, XV, 227.
[64] L. S. Taylor, Bureau of Standards Jour. Research, 1930, III (R. P. 119), 631; RADIOLOGY, July, 1930, XV, 49.

factory and should be checked by ionization measurements made by moving the chamber across the beam.

In addition it was found that, when the radiation is taken off the target at a small glancing angle as in Duane's system,[65] the beam intensity may vary appreciably over its width, thus prohibiting the use of wide diaphragms.

Taylor and Singer[66] have more recently reported a difference between the qualities of the radiation taken from the focus and the rest of the target. The presence of both of these radiation qualities will not affect the standard chamber measurements, whereas they do affect the thimble chamber readings. This is another reason for restricting the beam to the focal radiation alone.

On the basis of the reasons presented above, we may review what appear to be the requirements for a standard diaphragm system: (1) The X-ray beam should be so diaphragmed near the tube as to eliminate all stem and target radiation, at the same time providing uniform intensity distribution over the area of thimble chamber and standard chamber diaphragm. (2) The inverse square law for a small focus tube should apply to the distance between the focus and chamber or chamber diaphragm. (3) For a broader focus tube, the tube diaphragm area should not exceed such an aperture as determined by the focus and tube diaphragm, and that the inverse square law should be applied between tube diaphragm and the chamber diaphragm. (The last condition is the more accurate though not always practical.)

Except as mentioned, the calibration of a thimble chamber against a standard is not pertinent to the discussion at hand. This has been treated in some detail by Behnken[67] and in two papers by Taylor and Singer.[68]

[65]W. Duane and E. Lorenz. See Footnote 18.
[66]L. S. Taylor and G. Singer. Bureau of Standards Jour. Research (in press).
[67]H. Behnken, Strahlentherapie, 1927, XXVI, 79.
[68]L. S. Taylor and G. Singer. See Footnote 55.

The difficulties involved in such calibrations are well indicated by the recent work of Reisner and Neeff,[69] who reported supposedly large errors in calibrations made at the Physikalisch-Technischen Reischsanstalt. A later paper by Behnken and Jaeger[70] has pointed out the source of their error; and likewise an analysis, according to the discussion above, shows that their results are based largely on improper experimental conditions.

It may be noted that for the calibration of a secondary chamber such as Failla's "drum head" type, the X-ray beam entering the standard might have to be unduly large. This may be avoided by determining in advance the degree of uniformity of the beam over the area subtended by the "drum head" and correcting therefor.

V. QUALITY MEASUREMENTS

1. Energy distribution in the spectrum

Measurements of the wave length energy distribution or quality of a beam of radiation have no direct effect on the measurements made with a standard chamber, since this is by definition independent of wave length. By being independent of wave length, we really mean, however, that the measured ionization depends upon wave length in exactly the same manner as does ionization in free air.

Quality measurement is important when calibrating the common form of thimble chamber, since, in general, the ionization they measure varies rapidly with wave length, particularly at lower voltages. We must, therefore, employ a uniform method for expressing this quality. In Germany the half value layer (H.V.L.) in copper or aluminum is extensively used. Since the H.V.L. depends also upon the wave form of the generating voltage we see that such

[69]A. Reisner and T. C. Neeff, Strahlentherapie, 1929, XXXIV, 313.
[70]H. Behnken and R. Jaeger, Strahlentherapie, 1930, XXXVI, 778.

a method is in error if applied to different types of X-ray generators, as, for example, strictly constant potential (*i.e.*, zero ripplage) or sinusoidal half or full wave potential.

The effective wave length of general radiation, as proposed by Duane,[71] is not so open to this objection. Quimby[72] has reported a very careful study of the quality measurements made on the same beam of radiation by several different methods and finds that they all differ radically and not in an easily interpretable manner. This indicates clearly the necessity of a general agreement on the use of only one method of quality measurement. Many reasons may be put forward in favor of adopting the effective wave length method.

Since Duane's first proposal, Duane, Hudson, and Sterling[73] have proposed a slight variation in the method, so that we now find in common use the effective wave lengths obtained by the absorption in 1.0, 0.50, and 0.25 mm. of copper and 4.0 and 1.0 mm. of aluminum. Quimby pointed out that no two of these measurements could agree except for very hard radiation.

Later, Taylor[74] investigated quantitatively the differences involved between the several effective wave length methods and finds marked differences between values obtained with 1.0, 0.5, 0.25 mm. and very thin copper absorbers. His results check Quimby's[75] and, moreover, show that a very thin filter method is least ambiguous and should be used in the standardization laboratory. For practical purposes the 0.25 mm. absorber may be used except for radiation which is lightly filtered, say for radiation having in excess of 0.3 mm. initial copper filtration.

Taylor's[76] results also showed that precise quality measurements cannot be made with a thimble chamber, although the lack of precision is not sufficient to prevent their use clinically. One precaution is always necessary in making quality measurements—the filter must be placed at least 10 to 15 cm. from the ionization chamber so as to prevent enhancement of the ionization due to scattered radiation.

2. *Voltage measurements*

Ordinarily voltage measurements are of secondary importance in X-ray measurements, provided the intensity and quality are accurately known. In the standardization laboratory, however, voltage measurements are important as checks on other measurements.

There has been much discussion recently of the validity of sphere-gap voltage measurements applied to constant or rippled voltage. Mutscheller[77] finds sphere-gap measurements 15 to 20 per cent too high as compared with the minimum wave length voltage obtained with a small Seemann spectrograph. Taylor[78] has recently constructed a 100-megohm voltage multiplier with which it is possible to measure high potentials with an accuracy of better than 0.1 per cent. Using such an instrument in parallel with a sphere gap on a high "ripple-voltage" generator (0.2 per cent ripplage), he finds that the sphere gap measurements are accurate within their limits of calibration. Sphere gaps with ½ to 1 megohm of wire resistance in series may be used satisfactorily on any "constant" potential generator.

[71] W. Duane, Proc. Nat. Acad. Sci., 1927, XIII, 668.

[72] E. Quimby, Am. Jour. Roentgenol. and Rad. Ther., January, 1929, XXI, 64.

[73] W. Duane, J. C. Hudson, and H. N. Sterling, Am. Jour. Roentgenol. and Rad. Ther., September, 1928, XX, 241.

[74] L. S. Taylor, Bureau of Standards Jour. Research, 1930, V (R. P. 212), 517; to be published in RADIOLOGY.

[75] E. Quimby. See Footnote 72.

[76] L. S. Taylor. See Footnote 74.

[77] A. Mutscheller, RADIOLOGY, April, 1930, XIV, 385.

[78] L. S. Taylor, Bureau of Standards Jour. Research, 1930, V (R. P. 217), 609; to be published in RADIOLOGY.

ROENTGENOLOGICAL APPEARANCE OF INTERLOBAR AND MEDIASTINAL ENCAPSULATED EFFUSION IN THE THORAX

By EUGENE FREEDMAN, M.D.

From the Departments of Roentgenology and Pathology, Western Reserve University and City Hospital, CLEVELAND, OHIO

THE difficulty of establishing a clinical diagnosis of encapsulated effusions in the thorax has long been recognized. Roentgenology has taken a significant place as a diagnostic measure in checking the presence, location, and extent of these effusions as indicated by the clinical examinations and may reveal effusions not suspected by the most careful clinical study.

The present contribution is an investigation of the roentgenologic examination of these effusions as they occur in the interlobar pleura and mediastinum. With two exceptions, all the cases were proven by operation or autopsy.

Clairmont (*2*) divides the encapsulated effusions, according to the etiology, in five large groups.

(1) Para- and metapneumonic infections.
(2) Infections through the blood stream (following tonsillitis, puerperal infections, scarlet fever, etc.).
(3) Infections through the lymph stream from subphrenic abscesses, peritonitis.

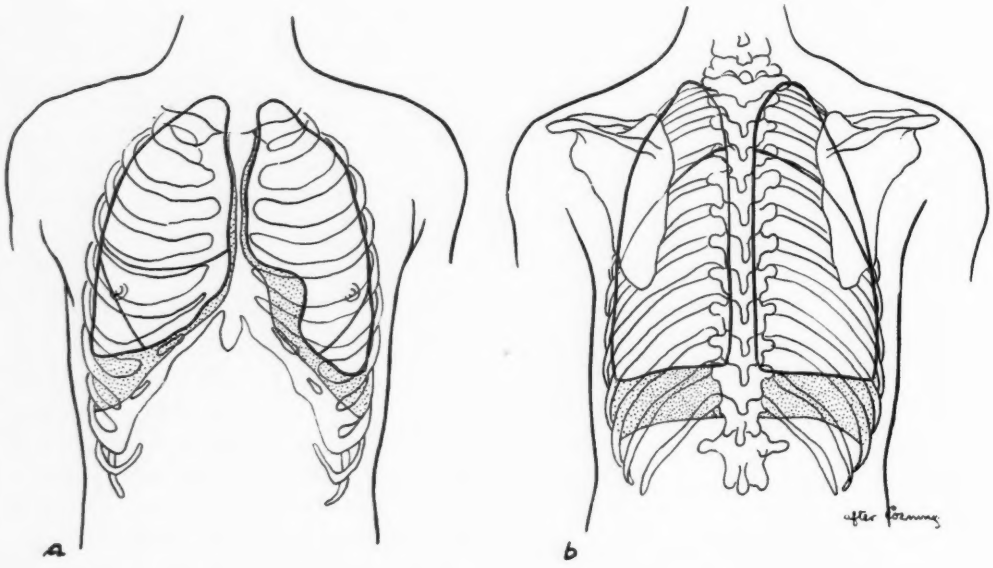


Fig. 1. Front (*a*) and back (*b*) views of thorax, showing the relations of the interlobar septa and lungs to the chest wall. *After Corning.*

(4) Infections in tuberculosis.
(5) Infections through chest wounds.

To these may be added, as a sixth group, the encapsulated effusions which occur from the passive hyperemia as a result of cardiac incompetence. Effusions may be situated in any part of the pleural cavity, but the interlobar and the paramediastinal spaces are the sites where their clinical detection causes most of the difficulties.

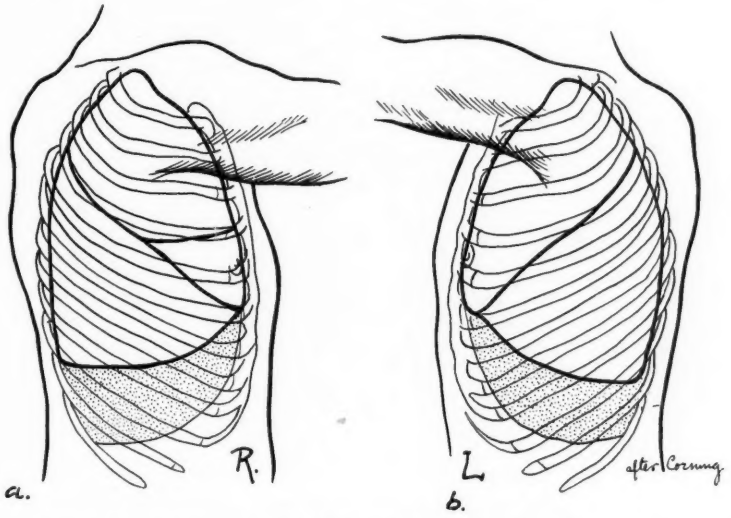


Fig. 2. Right (*a*) and left (*b*) lateral views, showing the interlobar septa. *After Corning.*

THE INTERLOBAR EFFUSION

A brief recapitulation of the anatomical situation of the septa will aid in understanding the problem.

The left lung is divided into two lobes by a long fissure, the incisura interlobaris. Viewed from the costal surface, it begins dorsally about 5 cm. below the apex, about the level of the vertebral end of the third rib, and is continued downwards and ventrally to the diaphragmatic surface of the lung.

In the right lung there are two incisuræ interlobares which subdivide it into three lobes. One of the incisuræ is similar in its position and relation to the fissure in the left lung. It is directed, however, more vertically and separates the lower lobe from the middle and upper lobes. The second incisura begins in the main fissure of the dorsal part of the lung, and proceeds ventrally, ending at the level of the fourth costal cartilage. The middle lobe of the right lung is triangular or wedge-shaped (Figs. 1 and 2).

The interlobar effusions occur more often after a pneumonia than from the other causes enumerated in the first part of this article.

The localization of the process corresponds to the course of the interlobar fissure. A shadow extends from the hilum to the lateral chest wall in a vertical or oblique direction and at different levels of the lung fields, according to which part of the fissure is involved. The size and form of the shadow is manifold, depending on the amount of the fluid and the compressibility of the neighboring lobes. Usually the lower lobe is compressed and in such cases the upper border of the shadow is

sharp, and the lower border somewhat less distinct in the postero-anterior view. Small exudates which do not compress the lung are often band- or wedge-shaped and the larger ones are circular.

Otten (6) mentions the differential diagnostic fact that interlobar effusions are separated from the hilum by a narrow band of air-containing lung, but Assmann (1) and Fleischner (5) do not consider it as an infallible sign, stating that such an appearance occurs only if the medial part of the fissure is already obliterated. In the lateral view the shadows often overlap the heart, are ribbon- or wedge-shaped, and have straight or circular, but always sharply defined, borders. The diaphragm remains in normal position and moves freely. If, because of a complicating pneumonia, atelectasis, or effusion into the entire pleural cavity, the whole lung field becomes hazy, the roentgenologic examination cannot contribute much of value toward the diagnosis.

Fluoroscopic examination and films taken at different angles are essential, unless the patient's serious illness prohibits too much motion. Attention is called to the importance of the lateral views, which often give a clearer picture of the extent and exact location of the process, than do the routine stereoscopic and postero-anterior views.

Unquestionably at times these effusions are difficult to diagnose, principally when gas or air escapes into the interlobar space, giving the roentgenologic appearance of a lung abscess. The other diseases which can simulate the appearance of interlobar effusions are the pneumonias (particularly those of the right middle lobe and those which involve parts of the lobes situated near the septa, the so-called marginal pneumonias), localized caseating processes, and bronchial carcinomata.

Lobar pneumonia may cast a shadow in the postero-anterior view, similar to an interlobar process, but the lateral view will show that the entire lobe is clouded and the process ends at the interlobar septum. The marginal pneumonias and the localized caseations near the septa have one sharply defined border but their other borders will usually be irregular, merging gradually into the air-containing lung.

Occasionally an interlobar effusion may be present simultaneously with a pneumonic consolidation. If the pneumonia involves all the lobes of one lung, the roentgenologic examination, as stated before, will be of little value, but if only one lobe is involved, the presence of an interlobar effusion may be detected by a diagnostic sign which was first noted by Fleischner (4). He describes a case in which a pneumonic consolidation of the left lower lobe was present. Examining the patient in the lateral position he found that the consolidation extended from the interlobar septum downward and posteriorly. In the posterior part of the lower lobe the area of consolidation gradually merged into normal lung, but the interlobar septum, instead of being straight, showed a marked anterior bulging, which Fleischner (4) interpreted as an interlobar effusion surrounding the anterior border of the pneumonic area. Subsequently 500 c.c. of serous fluid were removed by a long needle inserted in the posterior axillary line. Roentgenologic examination after the thoracocentesis showed an encapsulated, localized hydropneumothorax in the region of the interlobar fissure, confirming his diagnosis.

The bronchial carcinomata, being invasive and infiltrative in character, do not cause difficulties in the differentiation, but, as our Case 7 shows, they may have clear-cut outlines and may be situated in the region of the interlobar septum. In these cases lipiodol injection into the trachea reveals the nature of the lesion, by visualizing the defects and irregularities of the bronchial contour produced by the tumor. The differentiation between interlobar hydropneumo-

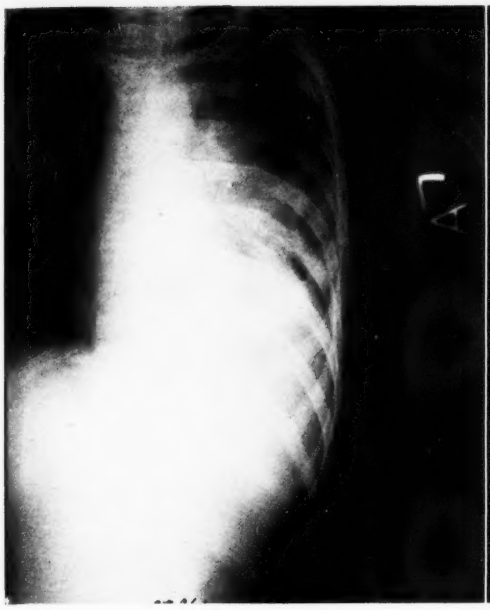


Fig. 3. Case 1. Interlobar effusion, showing an atypical shadow at the left base.

Fig. 4. Case 1. Lateral view, showing the basal shadow to be projected into the lower part of the left interlobar fissure.

thorax, encapsulated hydropneumothorax around the anterior or posterior chest wall, and lung abscess, according to Assmann (1), is at times almost impossible, and only through repeated, careful examinations can the diagnosis be approached.

A carefully taken clinical history and close co-operation between the clinician and roentgenologist are of paramount importance in these diseases.

CASE REPORTS

Case 1. L. D. (No. 50,863), colored female, 28 years of age, was admited to the City Hospital on January 27, 1930. Her illness started six weeks previous to that time with pneumonia. Since then she had had a slight cough, especially at night. There has been no hemoptysis.

On physical examination the lower left lung was found to be dull, with diminished tactile and vocal fremitus and breath sounds throughout this area. Her temperature on admission was 37.8° C., and remained at about the same level during the first days of her stay in the hospital. On the day after admission thoracocentesis was done and 20 c.c. of creamy material were removed. No organisms were found in it.

Roentgenologic examination on January 30th showed, in the postero-anterior view, a shadow of increased density throughout the medial two-thirds of the distal left lung, which extended to the diaphragm and had a semicircular, somewhat lobulated outer border (Fig. 3). The lateral view showed the same shadow to be wedge-shaped, extending from the anterior border of the diaphragm upward and posteriorly to the hilum (Fig. 4).

At operation by Dr. S. O. Freedlander on February 1st, the eighth rib was resected in the mid-axillary line for a distance meas-

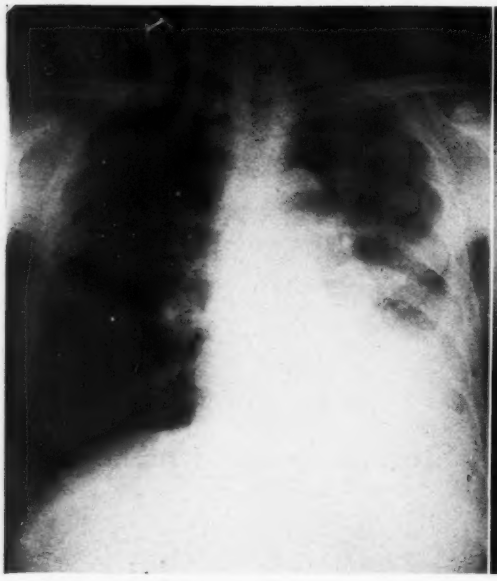


Fig. 5. Case 2. Interlobar effusion extending into the mediastinal space and showing a double left cardiac silhouette.

Fig. 6. Case 2. The interlobar character of the effusion is well seen in this semi-lateral view.

uring 7.5 centimeters. On aspiration, thick yellow pus was obtained. An opening was made in the pleura and a rubber tube inserted in the cavity containing the pus.

In this case the interlobar character of the effusion was clearly demonstrated in the lateral view, which showed the shadow to be situated in the course of the interlobar fissure. The operation substantiated the findings, there being found a collection of pus in this area.

Case 2. A. S. (No. 53,348), white male, 46 years of age, by occupation a moulder in a foundry, was admitted to the City Hospital on May 14, 1930. The patient had been ill for the past thirteen months, almost continuously. He had had pneumonia at the onset of his illness. After that he had complained of almost constant pain in the chest, much worse during the last two weeks, when he had begun coughing more profusely and expectorating small amounts of sputum, not of foul odor. There had been no hemoptysis. During the last year the patient had lost 17 pounds in weight.

Physical examination.—Percussion note was dull over the base of the left lung posteriorly, up to the level of the fourth rib. Breath sounds were distant over the dull area, but high pitched in character. There was slight decrease in tactile fremitus. Thoracocentesis was done on the day of admission in the left ninth intercostal space, posterior axillary line. Three c.c. of slightly turbid, yellow fluid were obtained, which contained 8,750 cells, with 90 per cent polymorphonuclear cells in disintegrated condition. The temperature during the first few days in the hospital varied between 37.5 and 39.8°C.

Films taken on May 15th showed a dense cloudiness at the left base, reaching the level of the fifth rib in the mid-axillary line. The cloudiness extended higher around the left border of the heart as a wide ribbon-shaped shadow, giving the heart silhouette a double contour. There was also a suggestion of a

slight amount of free fluid in the phrenicocostal sinus. The rest of the lungs showed beaded bronchial markings, suggesting pneumoconiosis (Fig. 5). Corresponding to the shadow at the base, in the semilateral view a wedge-shaped shadow was seen, which extended from the dome of the diaphragm to the hilum region (Fig. 6).

On June 3rd lipiodol was injected into the left main bronchus and subsequent films showed no evidence of bronchial obstruction. The distal ends of the bronchi being visualized, it was possible to determine that the lower lobe was displaced posteriorly and laterally. The roentgenologic diagnosis of interlobar pleural effusion was made. On account of the double contour of the left border of the upper heart shadow, it was suggested that some of the fluid extended into the mediastinal space. The possibility of a primary bronchial carcinoma was also considered at first, but this was excluded by the normal appearance of the visualized main bronchus.

The patient was operated on by Dr. S. O. Freedlander on June 11th. Incision was made over the ninth rib in the posterior axillary line and an area measuring 10 cm. in length was removed. An attempt to find the abscess was unsuccessful. The tenth rib was resected then and about 10 cm. of it removed. The lower lobe was covered by much thickened pleura and was adherent to the posterior chest wall. After many attempts an empyema cavity was located and entered, which contained 500 c.c. of thick, foul-smelling pus. This cavity was evidently situated between the pericardium medially, lower lobe behind, diaphragm below, and upper lobe above. A drainage tube was inserted and the skin partly sutured.

In this case, besides the interlobar effusion which is not obvious in the postero-anterior view, the ribbon-shaped shadow around the left border of the heart is worthy of note—the characteristic appearance of the mediastinal effusions. In one of our cases which we shall discuss later, we had the opportunity to prove the nature of a similar shadow by autopsy.

Case 3. W. P. (No. 53,145), colored male, 12 years of age, was admitted to the Sanatorium of the City Hospital on June 15, 1930. The patient's left wrist had become swollen on the palmar surface in November, 1929. It soon ruptured and began draining. During December and January the right wrist became swollen and also started to drain. Both continued to drain at intervals. The patient had had cough and expectoration for the last four months. The lungs were clinically negative. The clinical diagnosis of tuberculous synovitis of both wrists was made, and the patient was referred to the roentgen-ray department for an examination of the chest.

Films taken on June 26th showed an interesting, somewhat circular shadow between the seventh and tenth ribs, which measured about 8 cm. in diameter. The shadow was sharply defined, with the exception of the lateral circumference, which was irregular (Fig. 7). The lateral view showed the interlobar septa between the upper and middle lobes and between the middle and lower lobes to be thickened. The shadow seen in the postero-anterior view as circular, was more wedge-shaped in appearance and situated at the junction of the thickened interlobar septa (Fig. 8).

On account of the clinical diagnosis of tuberculosis, aspiration was not attempted. In this case, besides an interlobar effusion, a localized caseation of the right middle lobe was considered. Assmann (1) demonstrates in his text-book an antero-posterior view of a very similar case, which at autopsy was found to be a localized caseation in the right middle lobe.

The lateral view in our case demonstrates that the shadow does not involve the ante-

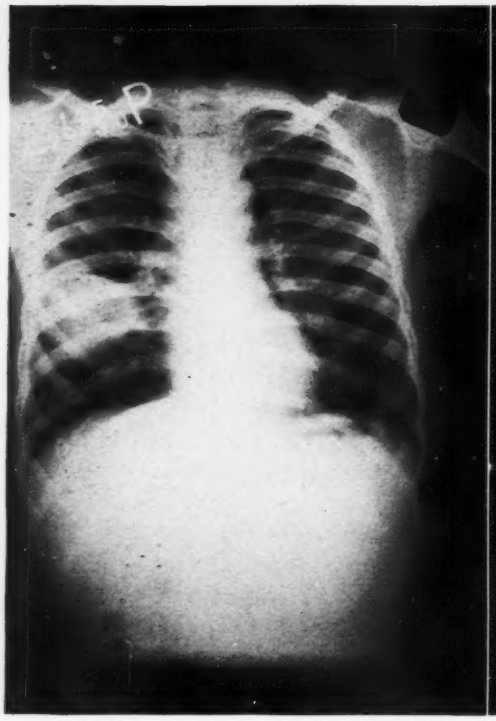


Fig. 7. Case 3. Encapsulated effusion at the junction of the interlobar septa on the right side.

Fig. 8. Case 3. The shadow is sharply defined and projected into the center of the right lung in the lateral view.

rior part of the region of the right middle lobe, and that its anterior border is sharp.

Case 4. E. H. (No. 48,877), white male, 76 years of age, was admitted to the City Hospital on September 2, 1929. He was confused and did not remember recent dates well. A few days before, he had had a fainting spell, striking his forehead. He thought he had not passed any urine for the last three or four days. Catheterization yielded about 5 c.c. of very bloody urine. The abdomen was markedly distended and tender.

The clinical diagnosis of ruptured bladder was made and 50 c.c. of air was injected into the bladder. Subsequent films showed free air under the right diaphragm, confirming the clinical diagnosis. The same films also showed marked enlargement of the left ventricular region. There was a well demarcated, circular shadow of increased density near the upper border of the right hilum, measuring about 6 to 7 cm. in diameter (Fig. 9).

At autopsy on September 4th a ruptured bladder was found, and 2 liters of hemorrhagic fluid in the peritoneal cavity. The patient also had had an aneurysm of the posterior wall of the left ventricle, and coronary occlusion.

Corresponding to the circular shadow near the right hilum, a localized interlobar effusion was found between the upper and middle lobes, well encapsulated, containing about 60 c.c. of clear fluid. Helm (5) and Fleischner (4) each describe a similar case

Fig. 9. Case 4. Interlobar effusion due to circulatory disturbance.

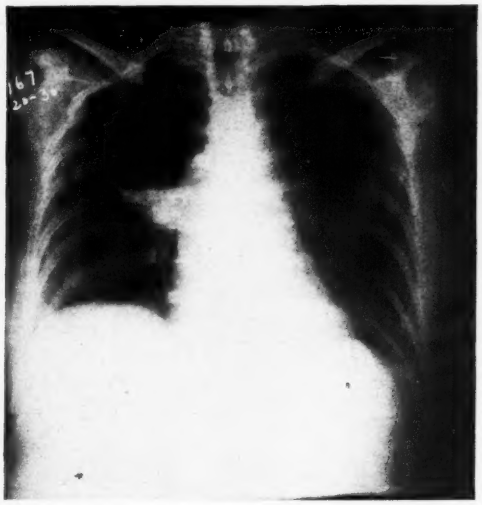


Fig. 10. Case 5. Oval shadow of increased density near the right hilum. The shadow is not sharply defined and appears not unlike an area of parenchymatous infiltration.

in which a serous interlobar effusion was found—and proven by autopsy—in patients suffering from circulatory disturbances.

Case 5. C. B. (No. 53,167), white female, 39 years of age, was admitted to the City Hospital on August 9, 1930. The patient complained of having coughed up about one-quarter of a cupful of blood four days before admission, the blood coming after a severe coughing spell. The next day she had had another hemorrhage, bringing up about a half-cupful of bright red blood, not clotted. There had been no pain before or during the hemoptysis. The patient had always been well until April, 1930, when she had had a hemorrhage, similar to the recent one.

The temperature during the first few days of her stay in the hospital varied between 36.5 and 38.0°C. The sputum was negative for tubercle bacilli on August 22 and 23, 1930. The lungs were negative clinically. Chest films taken before admission (on April 28, 1930) showed a few calcified nodules in a slightly enlarged right hilum, but no parenchymatous shadows were seen.

Films taken on August 20, 1930, showed a poorly defined oval shadow of increased density partly overlapping the right hilum, measuring 5 by 2 centimeters. In the lateral view this shadow was seen as a band of increased density, extending from the hilum to the anterior chest wall, situated along the course of the interlobar septum between the middle and upper lobes, and sharply defined. A roentgenologic diagnosis of interlobar pleural effusion was made (Figs. 10 and 11). A film taken on September 3rd no longer showed the oval shadow. The right hilum was still enlarged.

Taking into consideration the repeated hemoptysis, the patient's temperature, which stayed at the previous level even after the effusion had absorbed, and the enlarged right hilum, it is probable that the effusion was tuberculous in etiology.

This case presented unusual interest in that the effusion was not sharply defined in the postero-anterior view and closely sim-

Fig. 11. Case 5. In the lateral view the shadow is sharply defined, ribbon-shaped, and situated in the interlobar fissure between the right upper and middle lobes.

Fig. 12. Case 6. Interlobar hydropneumothorax simulating an ulcerative area in the region of the right upper lobe.

ulated an area of perihilar parenchymatous infiltration. In the latter case, of course, the prognosis would have been considerably more grave.

The complete examination, fluoroscopically, and films taken with the patient rotated at various angles is one of the most important factors in establishing the diagnosis, and if these factors are neglected, errors are almost unavoidable. Stereoscopic films alone are not sufficient in these cases.

In one of our cases, in which we neglected to carry out a complete examination, the roentgenologic diagnosis was erroneous at first, a closer diagnosis was established later, but the true nature of the lesion was revealed only during operation.

Case 6. J. Q. (No. 34,439), white male, 53 years of age, was admitted to the City Hospital on June 28, 1926. The patient had had a chill on June 22nd, with nausea and vomiting. These symptoms were followed by a sharp, continuous pain in the right chest, and during the three days before admission the patient brought up about 150 c.c. of blood each day. Clinically, at this time the patient had signs of consolidation in the right upper lobe. The sputum was negative for tubercle bacilli on July 4th and again on July 6th. The temperature varied between 37 and 38°C. during the first few days of the patient's stay in the hospital. Films taken on June 26th showed the upper half of the right lung to be increased in density, suggesting a pneumonic consolidation.

The patient's temperature continued and soon after this examination he began to expectorate about half a cupful of foul-smelling sputum daily.

Stereoscopic films taken on July 10th showed a marked change. There was a

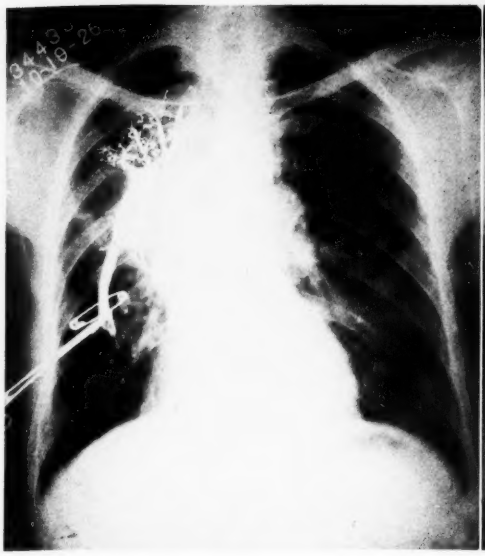


Fig. 13. Case 6. Film taken two months later after injection of lipiodol into the empyema cavity. The cavity is smaller and its connection with the bronchi is visualized.

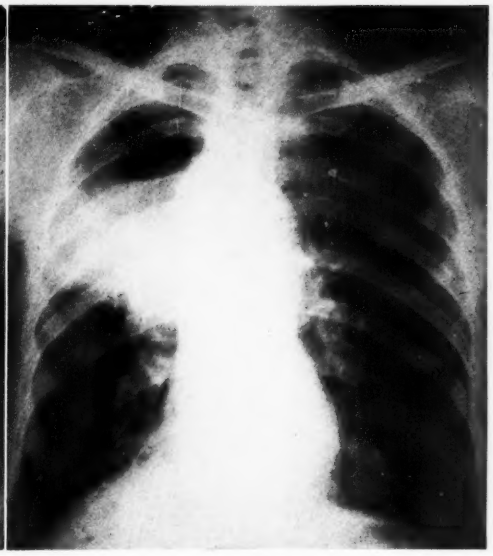


Fig. 14. Case 7. Bronchial carcinoma producing a shadow of increased density between the second and fourth anterior right ribs.

horizontal fluid level opposite the third rib anteriorly and above this a large semicircular radiant area, suggesting a cavity, occupying about one-third of the lung (Fig. 12).

The third series of stereoscopic films (taken on July 27th) showed no change. At this time it was suggested that, besides an ulcerative area, an encapsulated hydropneumothorax should be considered also. On July 28, 1926, aspiration was attempted in the third anterior intercostal space and 10 c.c. of seropurulent fluid were withdrawn.

The patient was operated on by Dr. S. O. Freedlander on August 24th, an incision being made over the right third rib in the anterior axillary line. About 4 cm. of the rib were removed subperiosteally. Incising the thickened pleura, a cavity was entered, measuring 8 cm. in diameter. It extended upward, posteriorly and medially, had a thick smooth wall, and contained a small amount of thick yellow pus. It seemed to be situated between the upper and middle lobes. In the upper medial portion of the cavity adjacent to the mediastinum there was a large bronchial fistula. A tube drain was inserted and held in position by silkworm gut.

On October 19, 1926, lipiodol was injected into the drainage tube and subsequent films showed an empyema cavity about the size of a thumb. The cavity apparently opened into some of the bronchi, as they were filled with the contrast material. Most of the cloudiness in the right upper lobe had disappeared by this time, only an oval shadow of increased density remaining in the region of the right upper mediastinum (Fig. 13).

The difficulty of differentiating interlobar empyema from a primary bronchial carcinoma is well illustrated in the following case.

Case 7. J. S. (No. 52,199), white male, 54 years of age, was admitted to the City Hospital on March 10, 1930. The patient

Fig. 15. Case 7. Bronchial carcinoma shown in the region of the septum between the right upper and lower lobes, with sharp anterior and posterior borders.

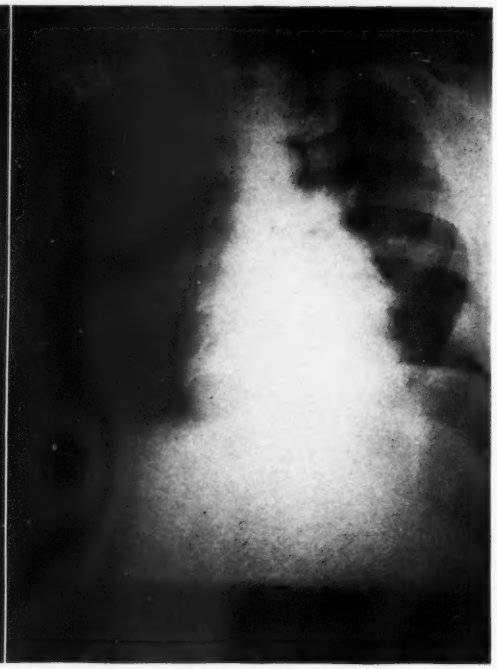


Fig. 16. Case 8. Mediastinal pleural effusion, producing a double cardiac silhouette on the left.

had been ill for the last two years, with loss of appetite and fever. Cough began about two or three months after the onset, and continued—severe at times. There had been several periods of blood streaking, but no hemoptysis. The patient expectorated about one sputum-boxful a day. Since the onset of the disease, he has lost about 25 pounds in weight.

The percussion note was dull over the right upper lung and hyperresonant elsewhere. Breath sounds were diminished throughout the right lung and exaggerated throughout the left. The temperature on admission and during the following days had a septic character, varying between 37.5 and 40°C. The white blood count was 26,400.

Films taken before admission to the hospital (on February 26, 1930) showed a dense, even cloudiness between the right second and fourth anterior ribs, extending from the heart shadow to the lateral chest wall. In the lateral view the shadow was projected into the region of the upper and posterior portion of the interlobar fissure between the upper and lower lobes, with its apex looking toward the hilum and its base toward the posterior chest wall. The shadow was sharply defined and had all the roentgenologic signs of an interlobar pleural effusion (Figs. 14 and 15).

A few days after admission withdrawal of the fluid was attempted, but none was found. Lipiodol was injected into the right main bronchus on March 13th and subsequent films showed a pneumothorax with a

fairly good collapse of the right lung, apparently produced by the attempted thoracocentesis. The lung was well outlined. The right main bronchus about 1 cm. below the bifurcation showed a narrowing and fine irregularity of its contour, throughout an area measuring about 2 cm. in length. This narrowing was more in favor of a bronchial carcinoma than of an effusion.

Bronchoscopic examination was done by Dr. C. W. Engler and five small pieces of soft tissue were removed from the right main bronchus, just below the bifurcation. The pathological diagnosis of the specimen was "small cell carcinoma."

This case had the typical roentgenologic appearance of an interlobar effusion. Its upper and lower borders were sharply defined, whereas in lung tumor one would expect to find irregular borders, gradually merging into the normal lung field. Fluoroscopically, there was no evidence of bronchial obstruction and the heart remained stationary during respiration.

The injection of lipiodol was of considerable help in establishing the diagnosis, showing the filling defect in the main bronchus. The other diagnostic aid was the involuntary pneumothorax, with complete outlining of the lung. In a chronic interlobar effusion, the surrounding pleura would be thick enough and adherent enough to prevent a collapse.

MEDIASTINAL PLEURAL EFFUSIONS

Mediastinal effusions were clinically first described by Laennec (9) and then by d'Andral (9), Cruveilhier (9) and Dieulafoy (9). The first roentgenologic description was given by Devic and Savy (9) in 1910. It is not a disease of the mediastinum as one would conclude from its name, but an intrapleural process, localized in the mediastinum.

The serous forms of these effusions are mostly of tuberculous origin and the purulent forms of pneumococcal origin. The causative germs extend into the mediastinal pleura from tracheobronchial lymph nodes, from the lungs, from the pericardium, and from disease of the thoracic wall and the different organs of the mediastinum.

They are divided into four groups: The right or left, anterior or posterior effusions. Combinations of anterior and posterior effusions of the same side occur often; combinations of the right and left effusions are rare.

The anterior mediastinal effusions according to Savy are represented by ribbon-shaped shadows, parallel to either the left or the right cardiac silhouette, and producing a double cardiac contour on the diseased side.

The posterior mediastinal effusions produce either ribbon-shaped shadows running parallel to the left or right borders of the vertebral column, or triangular shadows in the cardiophrenic angles. The base of these shadows is upon the diaphragm and their apices are directed toward the hilum.

From a differential diagnostic standpoint pericardial effusions have to be considered at times, as the triangular right-sided mediastinal effusions may give a similar roentgenologic picture. These effusions, however, do not fluoroscopically show transmitted pulsations from the heart, whereas in case of pericardial effusion the pulsations of the heart can be seen. Furthermore, by rotation of the patient, the effusion can be projected away from the heart shadow.

The triangular shadows may imitate the bronchiectatic triangular shadows, occurring in the same region. Many of the bronchiectases are well localized in the cardiophrenic sinuses, and once the surrounding lung tissue becomes consolidated, or the diseased lower lobe collapsed (pseudo-empyema bronchiectaticum, Epstein, 3), the differentiation between the two conditions becomes

almost impossible. The exploratory thoracentesis is of no value in these cases either, because if the needle enters a bronchiectatic cavity, a few cubic centimeters of fetid pus can be withdrawn, establishing the erroneous diagnosis of empyema and submitting the patient to a valueless operation (Berthold Epstein's case). The only way to establish the diagnosis is to inject lipiodol into the bronchi, and determine whether or not they are dilated. Rist (7) is of the opinion that every patient who shows a triangular shadow in either of the cardiophrenic angles should be submitted to bronchography before any operation is undertaken.

According to the situation of the effusions, at times mediastinal tumors, aortic aneurysms, or paravertebral abscesses have to be ruled out. In the latter case a roentgenologic examination of the dorsal vertebræ will demonstrate the narrowing of the intervertebral spaces or bone destruction, establishing the diagnosis of Pott's disease. An aortic aneurysm shows pulsations, which are absent in a mediastinal effusion. Mediastinal tumors can be recognized by their lobulated contours.

The following cases are illustrations of mediastinal effusions.

Case 8. J. W. (No. 53,343), colored male, was admitted to the City Hospital on April 27, 1930. Four days before, the patient had had a chill, followed by fever, began to have a cough, and raised a considerable amount of sputum. Next day he had severe pain in the left upper and lower chest.

Physical examination (April 27, 1930).—The patient was markedly dyspneic and cyanotic. Expansion was lagging on the chest. There was a dullness below the left clavicle, with bronchial breath sounds and fine râles. On the 30th the breath sounds were diminished at the left base, but the signs of pneumonia were still confined to the left upper lobe. On May 6th there was a pleuropericardial friction rub at the left apex. On the 12th the patient had a rigid neck, a positive Brudzinski, and a suggestive Kernig sign. His temperature was septic in character, varying between 38.2 and 40.5°C. Death ensued on the following day.

Films taken on May 8, 1930, showed a sharply defined ribbon-shaped shadow of increased density around the left border of the heart shadow, giving a double contour to the left cardiac silhouette. The shadow extended from the hilum to the diaphragm. The aortic knob and right cardiac silhouette had a normal appearance. The heart was displaced to the right. The bronchial markings throughout the entire left lung were increased in density, and the same lung showed diminished air-content. The left diaphragm was higher than the right, due to a large gas bubble in the splenic flexure. On account of the pleuropericardial friction rub, a metapneumonic pericardial effusion was considered clinically, but the roentgenologic examination favored a mediastinal effusion, on account of the double left contour, and of the right displacement of the heart, which was obviously pushed aside by outside pressure (Fig. 16).

The next film taken, five days later, showed the shadow on the left to be a little smaller, less dense, but still defined with fair sharpness.

At autopsy on May 13th a small amount of inspissated yellow fibrinopurulent material was found in the anterior mid-dorsal region, well encapsulated between the leaves of the mediastinal pleura. Some of the material extended anteriorly around the base of the lung. Pericardial fluid was not increased.

Case 9. J. E., white male, 63 years of age, was admitted to the City Hospital on November 28, 1927. The patient complained of pain in the stomach and shortness of breath, which had developed about a

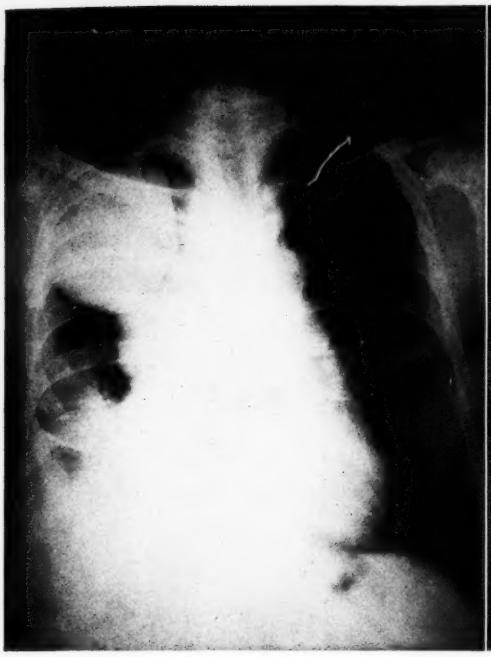


Fig. 17. Case 9. Encapsulated fluid near the right upper posterior chest wall; mediastinal pleural effusion and free fluid at the right base.

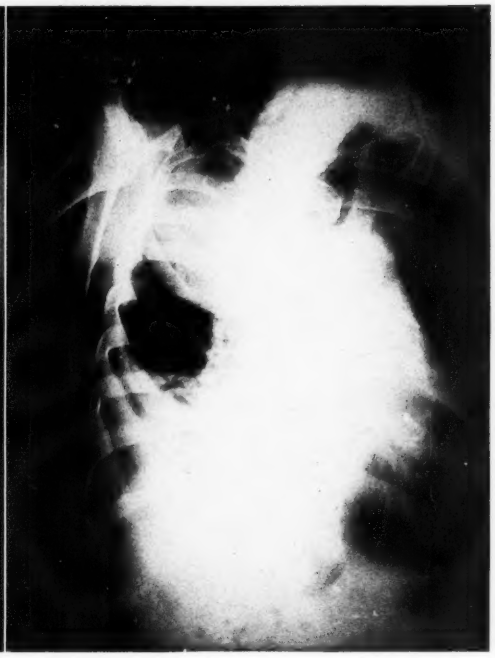


Fig. 18. Case 9. First oblique view showing the obliteration of the posterior mediastinal space and the circular shadow in the upper lung field.

week before. He had had some shortness of breath for the past year. It was impossible to ascertain complete details concerning the sickness, because the patient was confused.

Physical examination.—There was a dullness over the right upper lobe anteriorly and posteriorly and a dull percussion note was elicited at the right base posteriorly. Breath sounds were faint over the right lung and moist râles were heard over both lungs. The heart showed no increased activity or enlargement. The patient's temperature varied between 38.2 and 39.2°C. during his stay at the hospital. The white blood count on December 2nd was 12,800, with hemoglobin 85 per cent.

On December 3rd a needle was inserted at the angle of the right scapula and 275 c.c. of clear yellow fluid was withdrawn. No growth was obtained in the culture. Death took place on December 5, 1927.

Films taken on November 30th showed a sharply defined, circular shadow of increased density in the right apex and subapical regions, measuring about 10 cm. in diameter, and separated from the vertebræ by a band of air-containing lung. The right cardiac silhouette was obliterated by a dense, band-shaped shadow, measuring from 4 to 5 cm. in diameter, extending parallel to the vertebral column from the subapical region to the base. The two shadows partly overlapped in the apex. There was an uneven cloudiness at the right base, extending to the level of the ninth rib. The thickened interlobar septa between the right upper and middle lobes, and middle lower lobes were visualized, and the former was markedly displaced downward. The heart was dis-

placed to the right. The first oblique view, besides the cloudiness throughout the entire base, showed the apical circular shadow to be situated rather posteriorly. The entire posterior mediastinal space was obliterated by the band-shaped shadow seen in the postero-anterior view near the vertebral column (Figs. 17 and 18).

Autopsy was performed on December 5, 1927. Unfortunately the pathological protocol did not describe in detail the exact location of the pathological changes in the pleural cavity, briefly mentioning that there were numerous dense adhesions between the leaflets of the pleura, which separated encapsulated sacs of localized pus collections. There was also some free purulent fluid found among the leaves of the basal pleura. The purulent fluid removed from the base and from the encapsulated sacs amounted to 780 cubic centimeters. The right lung showed a generalized fibrosis. The right lower lobe contained several gangrenous cavities. The left lung, the mediastinal organs, and heart were found normal. The band-shaped shadow overlapping the right border of the heart is a characteristic illustration of a posterior mediastinal effusion. That this effusion was situated in the mediastinal space seems to be confirmed by the left displacement of the heart and by the oblique view, showing an obliteration of the posterior mediastinum. The signs of mediastinal embarrassment, as marked dyspnea and cyanosis, were also present in the clinical picture.

SUMMARY

1. The interlobar and mediastinal varieties of encapsulated effusions are discussed.

2. Interlobar effusions are characterized by sharply defined band- or wedge-shaped or circular shadows in the region of the interlobar septa.

3. Lobar and marginal pneumonias, localized and well circumscribed caseous consolidations, and bronchial carcinomata must be differentiated from these effusions.

4. In the presence of a pneumonia, the only roentgenologic sign of an interlobar effusion is the bulging of the interlobar fissure, seen in the lateral view.

5. Mediastinal pleural effusions are represented by band-, wedge-shaped, or triangular shadows parallel to the vertebral column or to the cardiac silhouette.

6. Pericardial effusions, paravertebral abscesses, aortic aneurysms, mediastinal tumors, and areas of bronchiectatic consolidation may give a similar roentgenologic appearance.

7. Bronchography is a valuable aid in establishing the diagnosis in both varieties of those effusions.

The use of Dr. S. O. Freedlander's operative notes is gratefully acknowledged.

REFERENCES

(1) Assmann, Herbert: Die Röntgendiagnostik der inneren Erkrankungen. Leipzig, 1922.

(2) Clairmont, P.: Die interlobäre Pleuritis. Arch. f. klin. Chir., 1919, CXI, 335.

(3) Epstein, B.: Mediastinale Pleuritis und ihre Beziehungen zur Bronchiektasie (Pseudoempyema mediastinale bronchiectaticum). Med. Klinik, Aug. 10, 1928, XXIV, 1224.

(4) Fleischner, Felix: Das Röntgenbild der interlobären Pleuritis und seine Differentialdiagnose. Ergeb. d. med. Strahlenforsch., 1926, II, 199.

(5) Helm: Cited by Felix Fleischner (4).

(6) Otten, M.: Die Röntgendiagnose der Lungengeschwülste. Fortschr. a. d. Geb. d. Röntgenstr., March, 1910, XV, 1.

(7) Rist, E., Jacob, P., and Trocmé, P.: Pleurésie Médiastine et Bronchiectasie: Etude Clinique et Radiologique. Annales de Méd., February, 1927, XXI, 144.

(8) Sante, L. R.: Roentgen-ray Diagnosis of Pleural Effusions—General and Local: Their Recognition, Localization, and Differential Diagnosis. Jour. Am. Med. Assn., Jan. 22, 1927, LXXXVIII, 215.

(9) Devic, E., and Savy, Paul: Les Pleurésies Médiastines: Considérations Générales sur l'Étiologie, l'Anatomie Pathologique et l'Examen Radioscopique. Rev. de Méd., 1910, XXX, 365.

(10) SERGENT, E., and KOURILSKY, R.: Quelques Réflexions sur l'Abus du Diagnostic de "Pleurésie Interlobaire." Bull. et Mém. de la Soc. méd. des Hôp., April 1, 1927, LI, 477.

(11) SINGER, SIEGMUND: Zur klinischen und röntgenologischen Differentialdiagnose des interlobären Empyems. Fortschr. a. d. Geb. d. Röntgenstr., November, 1921, XXVIII, 431.

Potassium in Radiobiology. Pietro Ottonello. La Radiologia Medica, May, 1930, XVII, 580.

According to the most recent theories, cancerous growths seem to be due, fundamentally, to either abnormal electrolytic processes or to deficiency of the intrinsic radio-activity of the cell. It should be logical to assume, therefore, that potassium, being the only substance existing in the human body which is at the same time an electrolyte and a radio-active element, should play a very definite rôle in cellular activities.

The author reviews the vast literature on the subject, and by referring in part to experimental findings and in part to plausible theories, is led to suggest the administration of potassium, either orally or intravenously, to cancer patients as an aid to X-ray or radium treatments. The suggestion is considered worth trying, potassium being harmless to healthy tissues and allegedly selective on neoplastic cells. Furthermore, even if potassium should, as has been claimed by some investigators, cause an artificial acceleration in the growth of the tumor, it would, for the same reason, facilitate further treatment by irradiation. Indeed, by activating the osmotic processes of the cell, by increasing the permeability of its membrane, and by favoring cell division in general, potassium would create essentially a sensitive stage in the life of the tumor and would render it more vulnerable to irradiation therapy.

L. MARINELLI.

Physical Therapy and Radiotherapy during 1929. Charles R. Brooke. Med. Times, February, 1930, LVIII, 55.

This review, which will be concluded in the March issue of *The Medical Times,* covers important articles on the subject of diathermy, ultra-violet, and galvanism. The review on radiation in the February issue includes the article by A. Bouwers on self-protecting tubes.

W. W. WATKINS, M..D

ROENTGENOLOGICAL ASPECT OF VARIOUS TYPES OF COLONIC DIVERTICULA[1]

By W. O. UPSON, M.D., and A. E. MacGREGOR, M.D., F.A.C.S.
Leila Y. Post Montgomery Hospital, BATTLE CREEK, MICHIGAN

SINCE the advent of the barium meal the various pathologic conditions of the colon have become of increasing interest, as by this means the character, severity, and location of the lesions can more accurately be determined. Among the various pathologic conditions studied by the opaque meal, diverticula have assumed an important place. Abbé, in 1914, discussed a case of diverticula diagnosed by Le Wald with the aid of the X-ray, and since that time a mass of comprehensive literature has been contributed on the same subject, until now nearly every phase of the predisposing conditions, the progress of development, and the roentgen signs in their various stages have been more or less fully discussed (1). The object of this paper is to review the development and the various phases of diverticula as demonstrated roentgenologically, with a brief description of the more practical roentgen-ray signs and a demonstration by means of a case report of the X-ray appearance of a ruptured diverticulum, resulting in an extra-colonic abscess.

DEVELOPMENT

Many theories as to the development of diverticula of the colon have been advanced, but since the use of the roentgen ray in their study it has become apparent that there are many causes. The idea that they are congenital is probably farfetched, as they are almost never met with in the barium meal examination of the young. It may be possible that some of the earlier diseases of childhood, such as cholera infantum, may produce localized areas of weakened wall in the colon that would be a predisposing factor to the development of diverticulosis. Acquired diverticula should be regarded as pathologic. Study and classification of a large number of cases seem to indicate that they are usually caused from infection and irritation from within the lumen of the colon, resulting in a localized irritation of the other layers of the tube. Such localized irritation finally allows a portion of the mucosa to invaginate itself into the submucosa, resulting in a hernia of the mucosa through the muscularis, usually at points where blood vessels penetrate the wall. The diverticulum may be single, but there are usually multiple diverticula, varying in number from 1 to 400 or more. The opening into the colon may be stenosed or as wide as the diverticulum itself, depending on the stage of development. Diverticula may involve any part of the colon, but usually are more numerous in the distal half—the iliopelvic junction is a favorite site. They may contain fecal masses and occasionally coproliths. In longstanding cases they give rise to diverticulitis, peridiverticulitis, or pericolitis, and frequently result in adhesions to the surrounding structures. Involvements occur in males two to three times as often as in females, appearing about once in every 450 cases in adults past forty, and ten out of thirteen cases are multiple (2). The relation of diverticula to neoplasms has been variously stated, varying from 1 to 3 to 1 to 20. This apparent discrepancy in reports by various authors is probably due to a variation in the ages of their groups and to whether or not adequate medical treatment has been applied. It is self-evident that in the untreated cases the inflammatory processes would be more severe, which is un-

[1]Read before the Radiological Society of North America, at the Fifteenth Annual Meeting, at Toronto, Ont., Canada, Dec. 2-6, 1929.

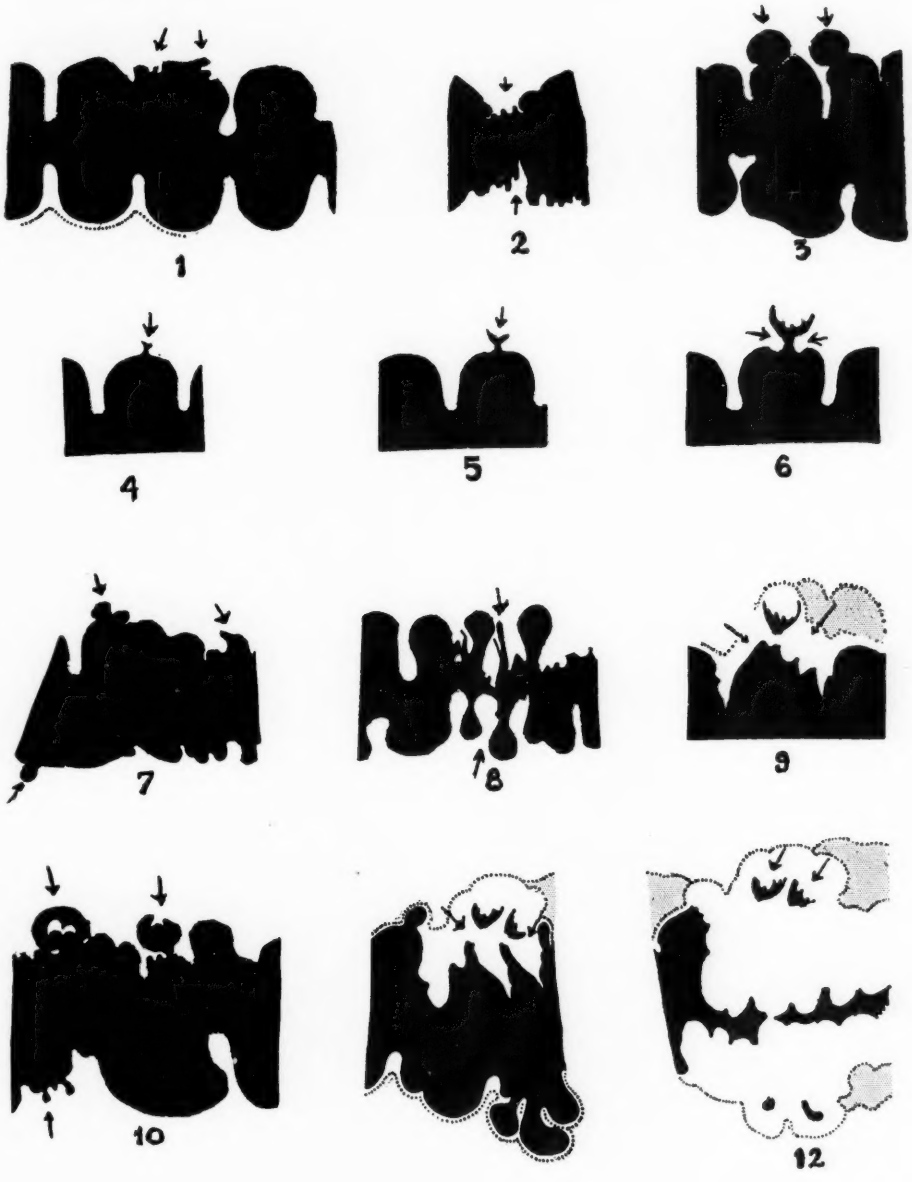


Fig. 1. A composite drawing by Spriggs and Marxer showing segments of colon, illustrating the various stages of the development of diverticula. (1) Small area showing pre-diverticular state. (2) Pre-diverticular state involving circumference of colon, causing a ring constriction. (3) Same section of bowel as shown in (2), after treatment. Signs of inflammation have disappeared, but two well-defined pouches have developed. (4) and (5) Same diverticulum observed over a period of four years, showing slow development. (6) Same type of diverticulum, showing advanced stage. (7) Section showing diverticulosis. (8) Diverticula, with signs of well-advanced inflammation. (9) Isolated diverticulum, with some thickening of the wall of the colon. (10) Well-developed diverticula supervening on areas of early inflammation. (11) Well-developed diverticulitis. (12) Same piece of bowel seven years later, showing marked increase in thickness of wall; isolation of diverticula.

Fig. 2. Drawings from the authors' cases, showing similar conditions to those illustrated by Spriggs and Marxer. (1) Pre-diverticular state. (2) Beginning development of pouches. (3) Well-developed diverticula. (4) Early signs of inflammation, with diverticulum containing a fecal concretion. (5) Diverticulitis involving a large portion of the colon. (6) Advanced diverticulitis, with considerable narrowing of lumen of the colon. (7) Advanced diverticulitis, with apparent isolation of some of the diverticula. (8) Advanced diverticulitis showing unusual length of the re-entrant angles of some of the diverticula. (9) Advanced stage of diverticulitis localized at the iliopelvic junction.

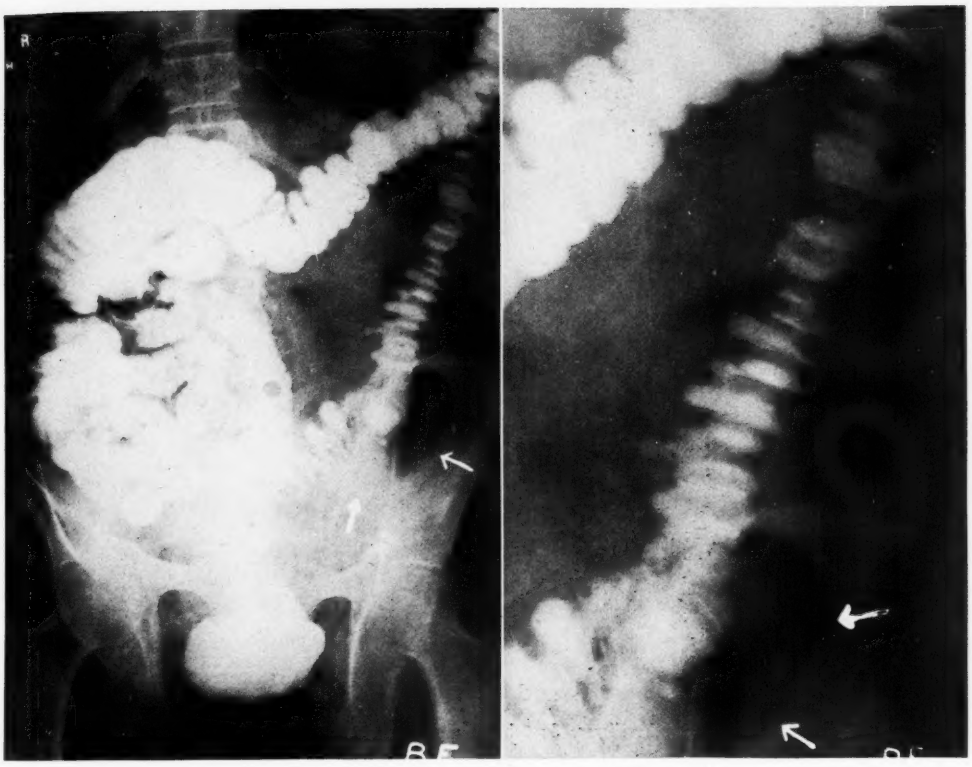


Fig. 3. Opaque enema revealing extensive diverticulitis of the distal colon. Note gas pocket marked by arrows.

doubtedly a predisposing cause of malignancy. Among the causes of diverticula, it is possible also to mention the markedly spastic distal colon, with dilated proximal colon. Under this condition the colon is subjected to considerable progressive pressure. The development of diverticulitis being a slow process accounts for the fact that most of the cases are found in adults over forty. The patients are usually well nourished and with good color. Chronic constipation is usually a factor. Blood is seldom, if ever, found in the stools in uncomplicated cases.

CLASSIFICATION

As far as the roentgen examination is concerned, the first classification to be mentioned is the pre-diverticular state in which the colon wall presents a serrated or sawtoothed appearance, with possibly some narrowing of the lumen of the affected area as first described in 1919 by George and Leonard (3). From this stage the process continues until a pouch is formed and an actual diverticulum is developed. From the deposit of fecal material in this pouch, irritation and inflammation are set up, the wall of the colon becomes thickened, the pouch becomes larger and a greater distance from the lumen of the colon, and the re-entrant angle at the neck becomes longer and more constricted. At this stage the infected material in the pouch is apt to set up inflammation, and a diverticulitis is developed. These various stages were discussed and clearly demonstrated by Spriggs and

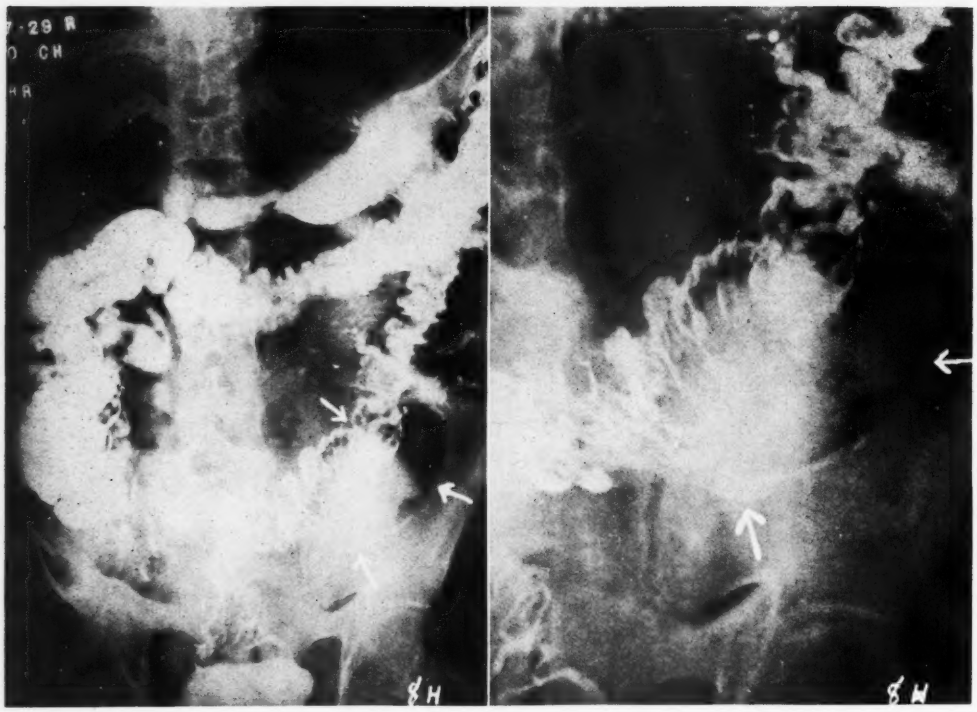


Fig. 4. Same case as shown in Figure 3; 8-hour observation. Note gas pocket at arrows, showing quantity of barium in the pocket.

Marxer in 1925 (4), and are illustrated by their drawings (Fig. 1). They had the advantage of watching the same case over a period of seven years and were able to observe the diverticulum passing through its various stages of development. A composite drawing made of some of our own cases will illustrate the various stages of the development of colonic diverticula (Fig. 2). As the irritation continues the wall of the colon becomes much thickened, the diverticulum more isolated, and symptomatology more pronounced. In a recent paper by Greensfelder and Hiller (5), attention has been called to a diverticulitis of the cecum which in its advanced stage simulates very closely the clinical picture of appendicitis.

Having the roentgenologic appearance of the numerous stages of the development of diverticula in mind, the roentgenologist is justified in not only reporting the actual condition found, but should draw attention to the prognosis and the ultimate outcome to be anticipated. If the signs of diverticulitis are pronounced, he should carefully note the area and extent of the colon involved, the thickness of the wall as compared to the lumen, noting carefully the size of the diverticulum, whether or not it contains fecal concretions, and especially, if possible, the length and size of the neck. In instances in which the diverticula are grouped, the possibility of their being associated with carcinoma should be borne in mind. Malignancy and diverticulitis may co-exist and in our own observations seem to do so in from 10 to 15 per cent of cases. Surely if the infected material in the diverticulum becomes isolated a dangerous process is apt to develop, and the rather rare

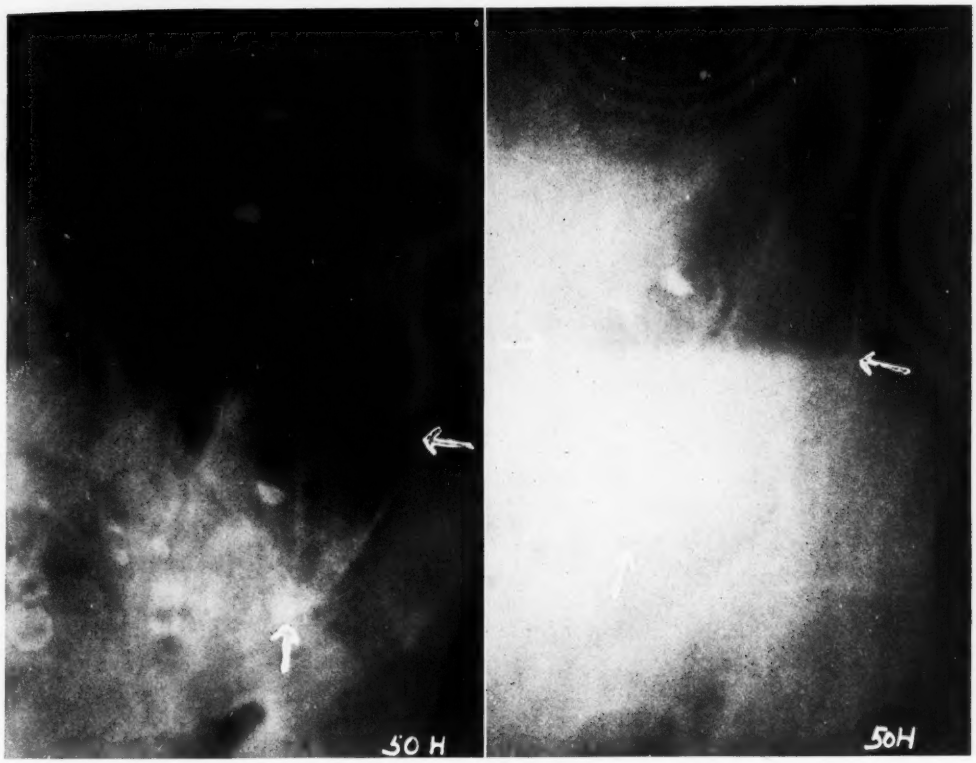


Fig. 5. Same case as shown in Figure 3; 50-hour observation. Gas pocket still in evidence. Standing film (*on right*), showing fluid level in pocket.

condition of a rupture through the outer wall of the colon may ensue, resulting in an extra-colonic abscess. If this condition has occurred, it is possible for the roentgenologist sometimes to detect it, as the case report which we wish to present will illustrate.

Mrs. S., age 63. Patient first noted pain in the left side about three years before examination. Pain at that time was very severe, seeming to radiate across the lower abdomen just above the symphysis pubis, and lasted about two days. There was definite tenderness. No mass was felt. There was no nausea nor vomiting. The pain disappeared, to reappear about twice a year for the following three years. The patient can think of no cause which might have brought on this pain, as strain or undue muscular exertion. Pain came and went spontaneously, though it was somewhat relieved by cathartics and hot compresses. She has not been constipated during the last three years. Five weeks before the patient came to the hospital, the pain returned with great severity. It was first noticed about midnight, when the onset was sudden, and was of a severe, sharp, shooting, cramping character, starting in the left lower quadrant, radiating directly across the abdomen just above the symphysis pubis. As before, there was no nausea nor vomiting. No urinary changes. No straining or coughing. Pain was relieved at this time by hot applications. Next day the pain was better, but that night returned with increased severity. Pain, although more severe on the left, had risen

so that it crossed the abdomen in approximately the midline. As before, the abdomen was tense, hard, and sore to the touch. No masses, tumors, herniæ, or abrasions were noted. A doctor was called and relief was obtained by three hypodermics. This pain continued until the patient's admission to the hospital. There was vomiting only once, this after she had eaten some tomato soup. There was no definite time relation of the pain to meals as is seen in peptic ulcers. The patient had been unable to eat because of the soreness in her abdomen: food was repulsive to her, and often made the pain worse. There had been no chills and no fever; no vomiting of blood. There had been much gas on the stomach throughout the period of the illness for which she had been admitted, and some gas was passed by rectum. Relief from the pain was not obtained by flexion of the thighs upon the abdomen.

The patient had had the usual diseases of childhood, though there was no history of acute intestinal disturbances when young. She had had influenza six years before admission, but no typhoid fever, amebic dysentery, peritonitis, or gastro-intestinal diseases.

X-ray findings of the colon.—The cecum was normal in size and position and was freely movable. The appendix was visualized—it was directed upward and inward and partially retrocecal. There were diverticula scattered throughout the colon, more numerous in the distal half (Fig. 3). The colon—descending and iliac—showed definite signs of diverticulitis. The wall of this portion of the colon was unusually thickened and the lumen was narrow and at certain points was constricted. In addition, there was a gas-filled space outside of the colon, lying outward and posterior to the colon in the left iliac fossa, which measured nearly four inches in its greatest diameter. At the 8-hour observation this gas pocket was found to contain considerable barium (Fig. 4). At the 24-hour and 50-hour observations, there was still a trace of barium retained (Fig. 5). At the 50-hour observation a standing film was made and a fluid level in the gas pocket was demonstrated (Fig. 5-*B*). It was evident that this cavity was caused by an extra-colonic abscess, probably the result of a ruptured diverticulum.

Roentgen diagnosis.—Diverticulitis, with an extra-colonic abscess in the left iliac fossa, resulting from a ruptured diverticulum.

Post-operative description of operation.—An incision four inches long was made over the left iliac region. The wall of the colon was found to be unusually thick and studded with diverticula. Adhesions were encountered everywhere. The dissection was continued downward and to the outer side of the colon and deep in the left iliac fossa an abscess containing at least 8 oz. of pus, barium, and fecal material was encountered. A drainage tube was placed in the cavity and the wound closed in the ordinary manner with chromic catgut. The skin was closed with silkworm gut. The patient made an eventful progress. A fecal fistula remained for about three weeks.

REMARKS

We are not making this presentation with the idea that all cases of ruptured diverticula will present this picture, but merely to show what happened in one instance, and to suggest that this and other signs should be looked for in the presence of diverticulitis. Local areas of extreme tenderness, associated with the position of the affected colon, definite fixation of a portion of the colon, extensive thickening of the wall of the colon, a palpable tumor, as well as a stationary gas pocket, should be looked upon with suspicion.

REFERENCES

(1) Abbé, Robert: A Case of Sigmoid Diverticulitis Simulating Malignancy, Demonstrated by Radiograph, Operation, and Specimen. Med. Rec., 1914, LXXXVI, 190.

(2) Köhler, Alban: Roentgenology, p. 535.

(3) George, A. W., and Leonard, R. D.: Use of X-ray in Study of Multiple Diverticulitis of the Colon. Med. Clin. N. Am., 1919, II, 1503.

(4) Spriggs, E. I., and Marxer, O. A.: Intestinal Diverticula. Quart. Jour. Med., 1925, XIX, 1-34.
Idem: Multiple Diverticula of the Colon. Lancet, 1927, p. 1067.

(5) Greensfelder, Louis A., and Hiller, Robert I.: Cecal Diverticulosis, with Special Reference to Traumatic Diverticula. Surg., Gynec. and Obst., June, 1929, XLVIII, 786.

DISCUSSION

Dr. Lester Levyn (Buffalo, N. Y.): If a certain nationally known slogan were to be transcribed so that it would be applicable to the field of radiology, it would sound somewhat like this, "When better colon work is done, Dr. Upson will do it." It is a privilege to pay tribute to the untiring efforts that the Doctor has made in attempting to reduce to a minimum the relatively large percentage of errors which exists in the interpretation of colon pathology. It is interesting to note that, despite the fact that diverticula were first described in 1845 and many important monographs have appeared, the most enlightening information has come since the first case was diagnosed by the X-ray by Dr. LeWald, and to-day the most valuable information can be obtained only by the X-ray. Dr. Case in his early work suggested that inasmuch as diverticula are frequently encountered without the presence of inflammation, the term "diverticulosis" be advanced to describe that type of case. I feel, however, that it is almost impossible at times to draw a line of demarcation between diverticulosis and diverticulitis. Dr. Upson described in his paper the two important roentgen signs of diverticulitis, namely, the pre-diverticulum stage, in which the persistent serrated appearance of the involved colon is noted, and secondly, the formation of diverticular pouches. I was also very glad to hear him, in his description of the slides, emphasize the significance of Dr. Case's sign, namely, the displacement of the small bowel away from the left iliac fossa.

The question of malignancy is one of great importance. Statistics from the Mayo Clinic show that in 15 per cent of their cases, malignancy and diverticulitis coexist.

Dr. Upson did not discuss in his paper, of course, the matter of technic, but I should like to emphasize the importance of the barium meal as being infinitely more valuable in the determination of diverticulitis than the barium enema, and also a word of warning, that when the enema is administered, it should be given, not under high pressure, because there is always the danger of a diverticulum rupturing.

The case that Dr. Upson demonstrated is of great interest, and I am quite certain it will stimulate us to look very carefully for persistent localized collections of gas. The Doctor has lived up to his reputation of telling us a great many things in a very short time, and I am personally very much indebted to him.

Dr. Gordon Webb (Owen Sound, Ontario): About three weeks ago I had a definite case referred to me by a surgeon, to see if I could help him to localize a tumor in the left lower quadrant of the abdomen. The tumor seemed to be fairly superficial, and by the aid of a barium enema I got a certain amount of opaque fluid past its site. There was no definite way in which I could localize the tumor or help the surgeon beyond this, that after I had given the enema, I had it evacuated, as is my usual practice,

and then I found that there were numbers of diverticula on the side of the sigmoid which looked exactly like grapes. In my report to the surgeon I suggested that this was probably a case of a diverticulum which had ruptured, and that he had to deal with a case of a localized abscess in consequence of diverticulitis. He operated on this lump and found it to be an abscess, and, tracing it downward to its source, he found, as I had thought he would, that it was an abscess which had resulted from a ruptured diverticulum. In this particular case he was lucky to find the hole in the side of the sigmoid from which the abscess had arisen.

DR. UPSON (closing): I wish to thank the discussants for their remarks, and I would say that in this paper I did not discuss the technic of the colon examination very extensively. I would, however, like to emphasize again what has already been stated in other papers in this meeting, that the colon injection should never be considered an X-ray examination of the colon. There are only a few things which you can ascertain by the colon injection alone. One should always insist on watching the barium meal through the colon, and then follow it with the colon injection. The colon injection should be given and the observation of the ingested meal should be made under the fluoroscope where manipulation, etc., can be carried out.

In regard to Dr. Webb's statement with reference to the plates made after the evacuation of the colon enema, I would say that I consider them to be very important. Another point brought out, that lateral or oblique plates should be taken, as the case may indicate, to better bring out the particular pathological conditions, is very timely. I was glad indeed to hear Dr. Webb report a similar case. I am quite sure that if we were to go back over the old plates, especially those showing diverticulitis, we would find other cases in which ruptured diverticula were demonstrated. I can assure you that a thorough study of these cases is very gratifying to the surgeon who has the case in charge. An extensive exploration in such a case would be very disastrous. Being furnished not only an accurate diagnosis but the actual size and location of the abscess, I have no doubt that the surgeon in Dr. Webb's case, as in mine, made an incision sufficient for drainage only, and did not find it necessary to do an extensive exploration, consequently the patient as well as the surgeon was benefited.

A RUGGED, DIRECT-READING IONTOQUANTIMETER OF HIGH SENSITIVITY

By LEO P. DELSASSO, University of California at Los Angeles, and
ARTHUR H. WARNER, PH.D., University of California at Los Angeles and
Soiland Radiological Clinic, Los ANGELES, CALIFORNIA

THE two most important parts of an iontoquantimeter are the ionization chamber and the instrument attached thereto for measuring the amount of ionization. It is the purpose of this paper to describe a new type of instrument to measure this ionization. In order to understand the requirements such an instrument must meet, a brief discussion of the instruments now in use must be given.

The ideal ionization chamber has been the subject of exhaustive research. As a result, several types are in general use. The majority of commercial iontoquantimeters use a small "thimble" chamber made of materials of light atomic weight. The second type, as used by Duane, also employs light materials, but obtains greater volume by a construction in which the ionization occurs in air between flat plates of which there may be a considerable number. The third type was developed by Dauvillier, who employs several hundred cubic centimeters of the rare gas, xenon, in order to obtain sufficient ionization to actuate a microammeter.

The use of the small chamber is of advantage in mapping the distribution of intensity in a beam, particularly in a water phantom. Its chief disadvantage lies in the type of instrument necessary in order to measure the extremely small amount of ionization produced in its restricted volume. The current must be guarded with care, and only costly amber, protected from contamination, will maintain the necessary insulation. The string electrometer is usually used to measure the current. Although it is very sensitive, it is quite rugged and consequently lends itself well to use in a portable instrument. The leads to the instrument must be kept short to maintain the sensitivity, prevent current leakage, and keep down expense. It is usually necessary for the operator to use the device in the treatment room, unavoidably exposed to some secondary radiation. It has the further disadvantage that it is not direct-reading. The rate of fall of the string must be determined by means of a stop watch. The greatest errors in timing occur when the beam is most intense, as the time of discharge is then quite short.

The difficulties of the string electrometer have been eliminated by one manufacturer, who has substituted a vacuum tube and relays by means of which the instrument is made to sum up the total dose. The insulation difficulties still remain, and something of ruggedness is lost.

With the use of the larger ionization chambers it becomes possible to use the less sensitive but more fragile galvanometer, or the microammeter, instead of the string electrometer, since the currents are considerably larger. The insulation given by high quality ignition cable is adequate, and the sensitivity of the instrument is not diminished by long leads. It is, therefore, possible to place the galvanometer and scale permanently in some convenient location suitable for it, where the operator will be protected from radiation. It is also possible to use the same galvanometer for any number of ionization chambers, if suitable switches are provided to connect them one at a time. As the deflection of the galvanometer is proportional to the intensity of the beam at all times, the instrument is direct-reading.

This latter system has several advantages over that employing the string electrometer: (1) Insulation difficulties are less serious; (2) it is direct-reading; (3) it can be made to serve more than one ionization chamber; (4) the operator has better protection from stray radiation. It is, however, subject to the criticism that a high sensitivity galvanometer is a delicate instrument. Its sensitivity depends upon the fragility of a pure gold wire only seven ten-thousandths (0.0007) of an inch thick and the nicety with which this supports a coil of fine copper wire between the poles of a powerful magnet. It commands and receives respectful care. If a rugged instrument of equal sensitivity were substituted for it, many more practitioners could avail themselves of the other advantages of the system of which it is a part.

It was suggested that a new electrostatic voltmeter developed by one of us might be made to serve this purpose.[1]

The electrical circuit employed with such a device is shown below. It is identical with the arrangement originally proposed and used by Duane. It approaches the ideal in all respects, except that the ionization chamber cannot be made as small as the thimble type.

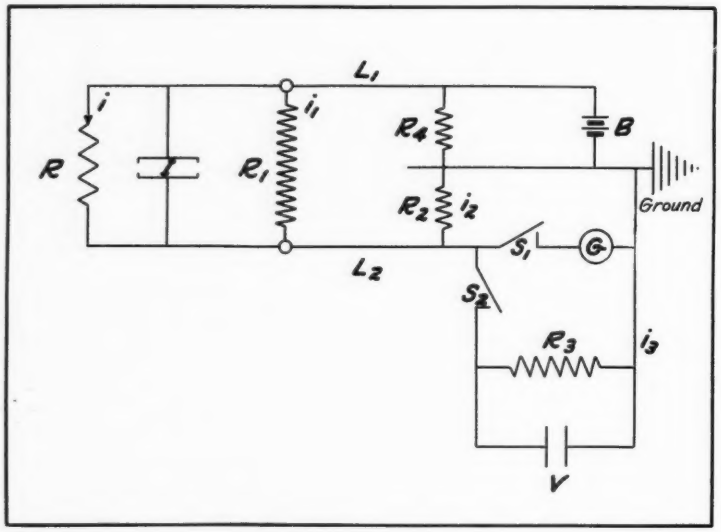


Fig. 1. Wiring diagram.

The new electrostatic voltmeter may be briefly described as a small quadrant electrometer in which the needle is supported by a suspension of very fine tungsten wire under tension. When a voltage is applied between one pair of quadrants and the needle, the needle will turn. By means of a small metallic concave mirror lacquered to the needle, the image of a straight filament galvanometer lamp is thrown upon a translucent scale. The position of this image upon the scale will depend upon the voltage applied to the instrument. A high resistance shunt converts the instrument into a device for measuring minute currents. When this instrument is placed in series with the ionization chamber and a battery in the position

[1] A description of this instrument will be published by L. P. Delsasso.

usually occupied by the galvanometer, the current flowing through the ionization chamber will also flow through the high resistance shunt of the instrument. The voltage between the two ends of the shunt will

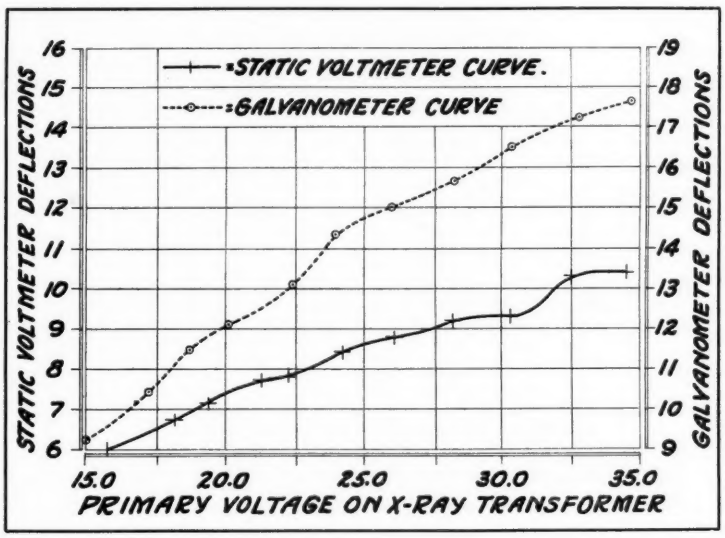


Fig. 2.

be proportional to the ionization current, therefore the deflection of the needle will be proportional to the ionization current.

The current through the instrument is given by the equation

$$I = \frac{V}{R_3}$$

where R_3 is the resistance of the shunt across the instrument, and V is the voltage.

Experimental arrangement.—In the wiring diagram shown in Figure 1, we have represented the usual Duane arrangement of battery B, connecting through a shielded lead L to the ionization chamber I. The ionization current ordinarily passes through another shielded lead L_2 to the galvanometer G, and so completes the circuit to the battery. This will occur above when the switch S_1, in series with G, is closed. R_2 and R_4 represent the leakage resistance of the shielded leads to ground, and R_1 the leakage resistance across the ionization chamber. R is the resistance of the gas in the chamber when X-rays are passing. The current through R_4 is returned to the battery without passing through the galvanometer, and so need not be considered. The leakage current i_1 through R_1 combines with the ionization current i through R and passes toward the galvanometer; i flows only when X-rays are passing, whereas i_1 flows at all times. This makes it possible to measure i_1, as it is the only current flowing through the galvanometer when the X-rays are off. As R_1 is usually extremely large because of the care taken to insulate the ionization chamber, i_1 is so small in a well designed and constructed instrument that it cannot be measured even by the high sensitivity galvanometer, and does not introduce any appreciable error. The current passing along the lead

toward the galvanometer will therefore be only that due to ionization. Some of this (i_2) may, however, escape through the insulation of the lead and so return to the battery, avoiding the galvanometer. Since the path through G has only about one-millionth of the resistance of R_2, i_2 will at best be only one-millionth part of the ionization current, the remainder passing through G. We can therefore safely state that the current measured by the galvanometer is the actual ionization current due to the passage of X-rays through the chamber.

By opening switch S_1 and closing S_2, we can substitute the electrostatic voltmeter for the galvanometer. This alters the situation somewhat, as the voltmeter has a very high resistance, R_3, comparable to that of R_2. An appreciable fraction of the ionization current will therefore pass through R_2 and escape measurement. It will be necessary to know in what proportion the current divides, and to be sure that the resistance R_2 and R_3 remain constant, so that this proportion will remain the same over long periods of time.

The measurement of the proportion may be made in either one of two ways. In the first, the ionization current is sent through the galvanometer, which measures it accurately. The static voltmeter is then switched in, causing the current to divide. The resistance R_3 is known and since the meter measures the voltage V caused by i_3 passing through R_3, i_3 may be calculated from the relation

$$i_3 = \frac{V}{R_3}$$

i_2 can then be found, for

$$i_2 = i - i_3$$

and

$$R_2 = \frac{V}{i_2}$$

Now i_1 will be smaller than when the galvanometer was in use, as the voltage across R_1 is less. We can, therefore, still neglect

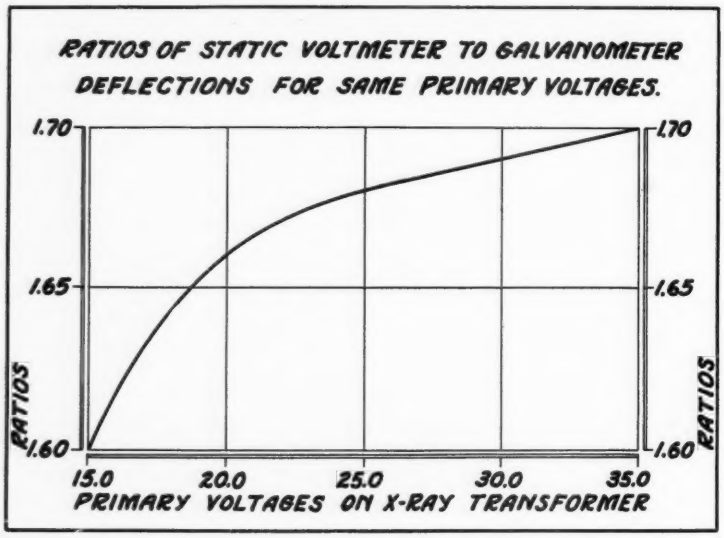


Fig. 3.

it. From these considerations, it follows that

$$i = \frac{(R_2 - R_3)\ V}{(R_2 R_3)}$$

The assumption has been made that the voltage across the ionization chamber is sufficient to produce saturation. For the particular chamber used, this value is 6 volts. The voltage across the chamber is the voltage of the battery (45) minus the reading of the voltmeter. The latter can consequently be as much as 39 volts and still satisfy this condition. In no case did it exceed 12 volts.

The second method is to measure R_2 by some one of the standard physical methods. It may then be used in the expression above with R_3 and the reading of the voltmeter V, to determine the current i.

It can be seen from the expression above that if R_2 and R_3 remain constant, the ionization current will be proportional to the reading of the voltmeter. In order to test this conclusion, we have measured i by means of a galvanometer and also by the static voltmeter, using the circuit described above. The readings of the two instruments have been plotted below (Fig. 2) for a number of different X-ray intensities. The ratio of the readings should be constant, and has been plotted in Figure 3.

It is apparent that the ratio *is* approximately constant. This is in spite of the fact that the installation upon which this test was made was designed to be used with a galvanometer, and the electrostatic voltmeter was not operating under the most favorable conditions. Improvements are being made which will increase the sensitivity of the meter and better adapt it to this use.

CONCLUSIONS

The electrostatic voltmeter is capable of measuring currents (10^{-9} amperes, or one-billionth of an ampere) which usually require a high sensitivity galvanometer. It is, therefore, suitable for measuring ionization currents from the Duane type of ionization chamber, and it makes possible the construction of a rugged, direct-reading iontoquantimeter of high sensitivity.

A FURTHER REPORT ON THE X-RAY TREATMENT OF MENORRHAGIA OF THE MENOPAUSE AND UTERINE FIBROIDS[1]

ANALYSIS OF ONE HUNDRED CONSECUTIVE CASES

By L. J. CARTER, M.D., The Bigelow Clinic, BRANDON, MANITOBA, CANADA

IN a former paper the writer detailed twenty-three case reports of uterine fibroids and menorrhagias of the menopause treated by X-ray, with 100 per cent cures. At the present time I wish to present a series of one hundred consecutive cases, and indicate the results achieved. For the sake of brevity individual case reports are not appended. Suffice it to say that the cases are not selected ones, but the series reported comprises every case treated during the period of time covered.

The conditions treated embraced all degrees of severity, but were mostly of the aggravated type. Many of the patients were brought to the treatment room on a stretcher. Many evidenced a degree of anemia requiring blood transfusions. Many showed a variety of pelvic inflammatory complications.

In presenting this larger series the writer has but two thoughts to emphasize:

1. The X-ray treatment of uterine hemorrhage and uterine fibroid is good for 100 per cent cure, providing that a careful examination has ruled out the possibility of malignancy. This, of course, is a conclusion which has been reached by many X-ray therapists, and for it the writer claims no special originality. He would, however, add his statistics to those furnished by many other workers, and thus accumulate the published evidence that this method of treatment has a sound and proven basis.

2. The real reason, however, for this communication, at the present time, is to emphasize the conviction that in these conditions it is possible to effect a cure with much less total X-ray dosage than is usually employed.

From the standpoint of technic the writer still adheres to 125 kilovolts, a 10-inch focal skin distance, and a filter of 6 mm. aluminum, with sole leather. The total dosage is spread over a period of three series, with a month's interval between the series. But, whereas, twelve years ago we kept the patient a week for each series, and delivered the treatment through sixteen ports of entry—eight anterior and eight posterior—we now keep the patient only two or three days for each series, and deliver the treatment in from four to six sittings through three ports of entry—all anterior. Formerly the ports of entry were small, and overlapping was avoided. Now we use larger ports and allow them to overlap.

The total dosage delivered is very much reduced. In the former report (1923), the technic for each series was given as 5 ma., 10 minutes through each port, 12 ports of entry. This made 600 milliampere-minutes for each series, or 1,800 for the entire treatment. Recently we have been using 5 ma., 10 minutes through each of three anterior ports and repeating this on a subsequent day. This makes 300 milliampere-minutes for each series, or 900 for the entire treatment. The total dosage has been cut in two, with no sacrifice of results.

So interesting did the results appear that we are now experimenting with a further cutting down of total dosage from 900 milliampere-minutes to 600. Instead of giving six treatments of 10 minutes each for each series, we are giving only four:—ten minutes

[1]Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Ont., Canada, Dec. 2–6, 1929.

through each lateral port, and 20 minutes through the central one. The results have been encouraging. Only very occasionally has there arisen the necessity of going beyond the three series of treatments to secure arrest of the hemorrhage. We expect this technic will constitute a future working basis. With this as a minimum, the treatment in each particular case will be modified according to the response obtained in the individual patient.

The chief factor in determining whether a greater or less dosage shall be required will be the presence or absence of fibroid changes in the uterus. The presence of fibroid changes is always a factor requiring the increased dosage.

In this series of one hundred cases treated, the average number of series for the menorrhagias not associated with fibroid changes was two and a half. In cases in which the hemorrhage was associated with fibroid change, the average was three series, while in the cases treated for the reduction of uterine fibroids alone, the average was five series.

The one hundred cases of the series are classified as follows: Hemorrhage of the menopause without demonstrable fibroid changes in the uterus (62 cases); hemorrhage associated with fibroid changes (19 cases); uterine fibroid without hemorrhage (12 cases); hemorrhage associated with inflammatory lesions in other pelvic organs (4 cases). Three proved later to be malignant.

The results may be tabulated as follows: The three malignant cases required subsequent radium and surgery, and the patients are alive and well at the present date. From fifteen cases no report has been obtainable. The remainder, without exception, remain cured, after intervals of from one to twelve years.

The contra-indications to the use of the X-ray in these conditions are few and definite. Associated pelvic inflammatory conditions may constitute a contra-indication to the intra-uterine use of radium, especially following a curettement. They do not constitute such a contra-indication when the X-ray is the therapeutic medium employed, but, rather, the opposite. The striking results secured in the X-ray treatment of boils and carbuncles find an analogy in the magic disappearance of pelvic inflammations after a course of X-ray therapy.

The presence of malignancy does form a contra-indication. Where there is any suspicion aroused, such as by the character and odor of the discharge, or the suggestion of degenerative uterine changes is elicited on bimanual examination, a diagnostic curettage should be done and the detritus subjected to pathological examination. In spite of careful and painstaking examination, malignancy may not evidence itself until later, as in the three malignant cases appearing in this series.

Another contra-indication to the use of the X-ray is the presence of urgent pressure symptoms from a large or incarcerated fibroid tumor. Surgery is then the treatment of choice.

Excessive size of a fibroid tumor may be a contra-indication to the use of the X-ray on account of the prolongation of treatment necessary, and the profound intoxication often associated with absorption of the degenerative products released during the retrogression of such a large tumor. I prefer surgery in these large fibroid tumors.

Another contra-indication to X-ray treatment is the subserous pedunculated fibroid. This is better removed surgically, especially if the pedicle permits of torsion.

I have had no experience with the submucous polypoid type of fibroid as a cause of subsequent recurring hemorrhage, after an apparent cure. If it does not yield promptly to subsequent X-ray treatment, surgery should be employed.

The X-ray treatment of uterine hemorrhage in women during the productive period should, in the writer's opinion, be generally avoided. Two such cases appear in this series. One received a complete series (one-third of the usual dosage) and another but half a series (one-sixth of the usual dosage). In each case the hemorrhage was controlled, and subsequent menstruations were normal.

In spite of these successes I have generally discouraged the reference of women in the child-bearing period for radiotherapy, fearing the effect on possible future offspring. There is experimental evidence indicating that the germ cell may be so modified by irradiation as to establish hereditary abnormalities, not in the offspring, but in descendants one or more generations remote.

Regarding the choice of radiotherapeutic methods, between the X-ray and radium, we believe this should be a matter of personal preference, depending on one's experience with the method employed, or his equipment. The desired results can be secured whether one uses the X-ray or radium. Personally, I prefer the X-ray, since, with the moderate dosage now employed, the treatment becomes a simple office procedure, not involving much loss of time or much discomfort to the patient. I prefer to reserve radium treatment for the malignant uterine and cervical conditions, which require hospitalization and operating room technic.

The *modus operandi* of the X-ray in the arrest of uterine hemorrhage and the reduction of uterine fibroids is generally regarded as the combination of a number of actions. Radiation is essentially a destructive process, involving the disappearance of the immature, rapidly growing, fibroid cell, and its replacement by connective tissue. The blood supply of the growing tumor is cut off, and the engorgement of the bleeding uterus is reduced by the production of an endarteritis. The Graafian follicle is either destroyed or undergoes cystic degeneration. The corpus luteum and the internal secretion of the ovary are evidently not destroyed. By the moderated dosage now in use the internal function of the ovary is not depressed to any greater extent than in the normal climacteric, for the radiotherapeutic menopause, as I have observed it following this series of treatments, has not been more stormy than the normal.

DEEP X-RAY TREATMENT OF CHRONIC GONORRHEAL INFECTION IN THE FEMALE[1]

By C. M. HENRY, M.D., C.M., F.A.C.S., REGINA, SASK., CANADA

CHRONIC gonorrheal infections have been a menace to civilization ever since ancient times; and, although medical science has done much to alleviate suffering in the great majority of cases, there are still a few of the most chronic gonorrheal infections that fail to respond to general medical treatment, as it is practised to-day.

Years before the Great War, and more especially since that event, governments, states, and provinces formed dispensaries for treatment, control, and supervision of patients afflicted with gonorrhea.

In Saskatchewan, since the Great War, public dispensaries have been opened and operated under the control and supervision of the Health Department of the Province. These dispensaries are manned by specially trained medical officers, and well selected laboratory assistants, but in the course of time the dispensaries gradually have accumulated a group of cases the smears of which remained positive for diplococci, in spite of prolonged and intensive medical treatment.

The Health Department, deciding not to discharge these patients until a cure was effected, realized that some remedy must be found, or these patients would become public charges on the Province for life, also menaces to the public as carriers of infection.

In the year 1924, the Health Department learned that Dr. H. E. Young, of British Columbia, had had encouraging results by using deep X-ray treatment on several cases of chronic gonorrheal infection. On the strength of Dr. Young's report, I was instructed by the Provincial Health Department of Saskatchewan to undertake the treatment of six female cases. The case reports pertaining to their physical conditions before and after treatment are appended to this paper.

Since I treated these, ten private patients have received similar treatment, with like results.

The six cases selected for deep X-ray therapy were all suffering from chronic gonorrhea of long standing, the infection having been present for from two to nine years.

Each patient had received intensive medical treatment, consisting of iodine, saline, soda, or lysol douches, all depending on the condition of the cervix; silver nitrate, or glycerin, and carbolic applications to the cervix, twice weekly, and sitz-baths twice weekly. Smears taken showed in every case the presence of pus and gonococci. Discharge in all the cases was of the same kind, being thick, profuse, and of a greenish-yellow color. Two of the patients complained of pains over the region of the tubes, and one patient had had a previous salpingectomy. All had edema and erosions of the cervix.

The X-ray technic was the same for each patient, regardless of age, physical condition, physique, or duration of the infection. Treatment was given through two portals of entry—one anterior pelvic, and one posterior pelvic, namely: F.S.D., 50 cm., K.V., 200 peak; filtration, ¾ mm. Cu and 1 mm. Al; 5 ma.; time, 60 min. for each port of entry. Treatments were given on alternate days.

The results in all cases, both dispensary and private patients, were practically the same. The erosions disappeared from the cervix; the discharge became very thin and

[1]Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Canada, December 2-6, 1929.

slight, and there followed a marked improvement in general health.

Smears taken over a period of four months after treatments failed to reveal the presence of gonococci in five of the six patients (the positive cases having had only one smear examined).

One patient menstruated three weeks following treatment; two, six months following treatment; one, seven months following treatment, and two patients did not menstruate until one year following treatment. These were the youngest of the group.

CASE REPORTS

Reports of each of the six cases are as follows:

Case 1. Age 21. This patient was admitted to the dispensary in April, 1920, for treatment, suffering with chronic gonorrhea. History of infection three years previous to her admission, but she had been having treatment and was supposed to be cured. She complained of pain over the region of the Fallopian tubes, intermittently, edema and erosion of the cervix, and profuse discharge of a greenish-yellow color. Some improvement was noted at times, but the symptoms recurred after continuous medical treatment for four and one-half years, the treatment consisting of vaginal irrigations of iodine, saline, soda, and lysol douches, with sitz-baths twice weekly.

Smear for gonococci taken August 16, 1924, was positive.

General physical condition: Thin, pale girl, with lowered vitality.

Deep X-ray treatment was given on August 20 and 22, 1924. Smears taken three months after treatment from the vagina, urethra, and cervix showed an odd pus cell, but no gonococci. The cervix then appeared normal, with no erosion. Discharge was very thin and slight. There was a marked general improvement in health. The patient menstruated three weeks after treatment.

Case 2. Age 21. Admitted to the dispensary on December 18, 1923. She had given birth to a baby at 12 years of age, and infection was supposed to date from that time. Vaginal examination showed a thick, greenish-yellow discharge, and erosion of the cervix. Smear was positive for diplococci. Medical treatments were given as in Case 1, but the smear remained positive. The general health was fair.

Deep X-ray treatment was given August 24th and 27th, and smear examinations were made on the following dates: *September 3rd,* from cervix, urethra, and vagina; pus present, and extra-cellular diplococci; *October 14th,* from cervix, urethra, and vagina; pus and gonococci present; *November 4th* (or 38 days after treatment), from cervix and vagina; pus present, but no gonococci; from vagina, no pus nor gonococci; *November 25th,* from cervix, urethra, and vagina; pus present, but no gonococci found; *December 2nd,* from urethra and vagina; no pus nor gonococci present; from cervix, pus; no gonococci; *examinations from January 13th to February 2nd,* from cervix, urethra, and vagina; no pus nor gonococci found.

This patient was negative for gonococci 38 days after X-ray treatment, and remained negative. She received regular treatments, following deep therapy, of vaginal douches and applications of silver nitrate, 20 per cent, to the cervix and urethra. No vaginal discharge, and the patient reported that her health was improved 100 per cent since treatment. She menstruated seven months following X-ray therapy.

Case 3. Age 23. This patient was admitted to the dispensary on November 13, 1923. She had contracted gonorrhea one year previously, and during those twelve months had been receiving treatment.

Vaginal examination revealed edema and erosion of the cervix, with profuse, greenish-yellow discharge. A smear was positive

for gonococci. The general health was good.

This patient received the usual medical treatment, as given to the others, but the smears remained positive, and the discharge persisted.

Deep X-ray treatment, over the prescribed areas, was given on August 20 and 22, 1924, with the result that the cervix appeared normal, there was no erosion, and the discharge was very thin and scanty. The patient's general health improved. Smears taken from the cervix, urethra, and vagina showed a small amount of pus, but no gonococci. The patient's menstrual cycle was not regular for six months.

Case 4. Age 19. Examination made on July 31, 1922, revealed a large amount of purulent discharge, edema, and erosion of the cervix. Smears showed pus and extracellular diplococci. The general health was fair.

On December 2, 1922, the patient had a double salpingectomy. Following this, she received routine treatment, but the discharge persisted, with no improvement until deep X-ray treatment was given August 20 and 22, 1924. Following that, the discharge became slight, and the cervix normal. Smears taken on October 18, from the cervix, urethra, and vagina, showed an odd pus cell, but no gonococci: negative in 57 days. December 20, smears from the cervix and vagina showed an odd pus cell, but no gonococci; from the urethra, no pus nor gonococci. The patient did not menstruate for eight months.

Case 5. Age 14. This patient was admitted to the dispensary in September, 1923, the innocent victim of a carnal knowledge case. Examination revealed the same condition as found in the former cases, which resisted routine treatment. Following X-ray treatment (given on August 20 and 22, 1924), smear taken 18 days after treatment (on September 9) was negative for gonococci, but the patient did not menstruate for nearly a year.

Case 6. Age 28. This patient was admitted to the dispensary on August 20, 1923. She had been receiving treatment for two years. She complained of pain in the region of the tubes and ovaries. Smears taken were positive for gonococci, and the usual medical treatment was given, but the condition persisted.

Deep X-ray treatment was given on September 4 and 6, 1924. The discharge became very thin, and whitish in color. The cervix appeared normal and the general health was much improved. Smears taken on September 25, three weeks following therapy, were negative for gonococci, and continued negative by examinations made from time to time, until February 3, 1925, when the patient was discharged. Menstruation returned in six months.

SUMMARY OF THE CASES

Six cases of gonorrheal infection of the vagina, urethra, and cervix, treated by deep X-ray.

Ages of group, from 14 to 28 years, the average being 21 years.

Negative smears within three months, following radiation treatment.

One patient became pregnant three months following treatment.

Two patients did not menstruate for one year; they were the two youngest of the group.

Four patients menstruated before eight months.

All patients showed marked general improvement in health.

Three patients have married and become respectable members of their community, but have no children.

Two patients did not report after one year, and are not living in the Province now.

I wish to acknowledge my indebtedness to the Saskatchewan Public Health Depart-

ment for kindness in granting me the use of the records of the six cases reported.

DISCUSSION

DR. H. E. SCHAEF (London, Ont., Canada): This report is most interesting and is along the same line as the cleaning up of diphtheria carriers' tonsils, which was reported by Dr. Hickey some few years ago. You will remember he cleaned up diphtheria carriers which otherwise could not be cleaned up. In that connection it has always been understood that the X-ray is not a disinfectant—that is, that it will not destroy a micro-organism.

Some few years ago at the University with which I am associated, they were working on liver extract, and were trying to figure out a method of sterilizing the mixture without boiling it or adding chemical agents which might interfere with the action of the extract. They tried submitting it to radiation, and the strange part of it was that, while they always got a very good culture on agar plates from the extract, after radiating it a very short time in a shallow dish, it was negative. Ever since then I have been quite dubious as to whether or not our former opinion was correct. How much we can use radiation for that purpose is a question.

I would like to ask Dr. Henry if in these cases the patency of the tubes was checked up. True, in several cases pregnancy followed, so that the tubes must have functioned, still it would be interesting to know in how many of the cases the tubes functioned after treatment. In gonorrheal infections the tubes are usually destroyed anyway, so that it really does not matter so very much. Still it would be worth while, if one could get some record on that point, and I am just wondering if the cases had been checked up with lipiodol, or if operation for some reason or other might have followed and the tubes sectioned.

DR. JOSEPH FREEDMANN (New York): A little over two weeks ago Dr. Frank J. Horn, of New York, referred a patient to me, a young woman about thirty years of age, who for many years had suffered from gonorrheal salpingitis. She had had several operations. There was a very marked discharge, which was practically continuous, and which no medication had succeeded in helping. The patient was referred to me for a partial castration dose. The referring physician told me the object of the treatment was to stop the functioning of the ovaries and to decrease pelvic congestion. He had read in the German literature that by this method of treatment very excellent results had been obtained and the discharge entirely eliminated, with return of normal menstruation.

On account of this young woman complaining of pelvic pains, I did not give her the treatment in just one or two doses, but gave it over a period of six treatments, that is, one every other day.

Listening to Dr. Henry's paper, I was extremely interested to hear what we can do with patients of this type.

DR. F. C. CHRISTENSEN (Racine, Wis.): This is a most interesting subject, indeed. It opens up a new field in radiotherapy and therapeutics—a field, however, in which we have to be careful.

Dr. H. J. Baggs, of Memorial Hospital, New York City, has for some years been studying the effects of radiation upon the offspring of animals. Many deformities result, such as single kidney, one eye, club foot, etc., from radiation.

Four years ago, while in Vienna, I was visiting with Dr. Wiebel and saw him do a vaginal section on a woman five months pregnant. The patient had had pulmonary tuberculosis and was suffering with menorrhagia for which she had been given X-ray treatment. She ceased to menstruate and

it was thought to be the result of the X-ray treatment, but later she was found to be pregnant. On account of the X-ray treatment they feared that there would be some deformity in the child, hence the operation. The fetus appeared normal, but they were going to make a careful sectional study, the result of which I did not learn. That shows how fearful they are of X-ray treatment in cases of pregnancy.

I should certainly like to follow up further reports on the cases mentioned in this paper. Three of the six cases reported are probably sterile, and that is a matter one should consider before deciding upon X-ray treatment.

I am wondering whether it is necessary to give such heavy treatment. I use a much lower voltage, less filter, and shorter time in sterilization and find it efficient.

Here is another problem: Does the inflammatory reaction increase the radioresistance of the ovaries?

DR. G. E. RICHARDS (Toronto, Ont., Canada): I think it is about six years since radiologists in Victoria Memorial Hospital, Victoria, B. C., published a similar report. Have you made any reference to that? In this report there were a number of cases of this disease with good results following treatment, and I have in a corresponding way had some good results. The only objection that has ever been made to the method by gynecologists with whom I have discussed this question is the necessity of giving a dose which involves permanent sterilization of the patient. In Dr. Henry's paper these were nearly all young women. Some sufferers from this disease, of course, are mentally defective, and from that standpoint it is desirable that there should be sterilization. Others are not, and in that case it becomes a real problem whether or not such a dose should be given as will result in permanent sterilization. If that is going to result from the normal processes of the disease, by the salpingitis and the closure of the tubes, of course we might as well do it as let Nature do it.

I was interested in the last speaker's suggestion, that it may be possible to accomplish the same result without permanent sterilization. Apparently that is possible, in view of Dr. Henry's experience. Certainly it is a field which offers distinct possibilities, and I think we should all be prepared to follow it up.

DR. HENRY (closing): Yes, I made reference to Dr. Young's report.

I might say that all these cases were, as you know, chronic gonorrheal infections of from two to nine years' standing. The supposition was that they were sterile and that their tubes were closed, but it proved otherwise in regard to the one who became pregnant within three months after the treatment. The three others who were married have no children, but they have all menstruated regularly following the first year.

It would be most interesting indeed to find out whether or not the three who are married are sterile or not, but that is a rather delicate and difficult thing to undertake. Although we have thought of that, it is rather hard to get the former patients to submit to an examination of that kind. We may find out some more facts later on.

THE EFFECT OF X-RAYS ON THE THYROID AND PARATHYROID GLANDS

By O. M. WALTERS, M.D., B. J. ANSON, PH.D., and A. C. IVY, PH.D., M.D.
From the Departments of Physiology and Anatomy, Northwestern University Medical School, CHICAGO

EVEN though X-rays have been used rather extensively in the clinical treatment of hyperthyroidism, only a small amount of experimental work has been done on the effect of radium and X-rays on the thyroid and parathyroid glands.

Krause and Ziegler (1) exposed the thyroids of several common laboratory animals to X-rays and failed to detect specific changes. They killed their animals either immediately or only 72 hours after exposure, which explains in part the negative nature of their results. Rave (2), using the comparatively large dosage of from 12 to 36 Kienböck units, observed no histological changes. He killed his rabbits in from 5 to 8 days, which we believe was too soon to obtain definite effects. Rave also, in 1911, treated the thyroid of several human cases with X-rays and reported good clinical effects, but on removing the treated thyroid gland found only slight changes. The lymphoid tissue of the gland, as might be expected, was decreased; the colloid struma was unaffected. He stated that the effect of X-rays on pathological thyroid tissue was not settled. Pfeiffer (3) and Fiorentini and Louraschi (4) failed to obtain changes in the thyroid in dogs. Bower and Clark (5) implanted steel radium needles containing 12.5 mg. of radium for from 2 to 13½ hours into the thyroid gland of dogs. They concluded that the normal thyroid of the dog is highly resistant to the action of radium, no changes being demonstrable in the parathyroids. McCord and Marinus (6) exposed tadpoles to X-rays and found that the exposure made them more susceptible to thyroid feeding, which denotes apparently a stimulation with the doses used. Coulaud (9) found that very large doses of X-rays were necessary to affect the normal thyroids of rabbits, from 35 to 50 H being required to cause a slight decrease in the colloid and from 80 to 100 H being required to cause a definite decrease in colloid. We have been unable to find any reports in the recent clinical literature on the effect of X-rays on the histology of the human thyroid, save that the size of malignant tumors of the thyroid is decreased and the metastases are more difficult to influence than the primary tumor (7).

The experimental literature at hand indicates that *normal* thyroid tissue is resistant to X-ray, while the clinical literature tells us practically nothing about the effect of X-rays on the hyperplastic thyroid, but does indicate that in some way X-ray treatment benefits temporarily some 60 per cent of the patients afflicted with hyperthyroidism. We should keep in mind the possibility that the normal thyroid may be more resistant to X-rays than the hyperplastic thyroid, since it is well known that embryonic cells are generally more sensitive to X-rays than adult cells.

In this paper we will report the effect of a dose of X-rays used clinically on the histology of the thyroid and parathyroids and on the blood calcium of normal dogs. The dose used has yielded beneficial clinical effects in some patients with hyperthyroidism.

METHODS

Dosage.—The dosage used in these experiments was that used in the clinical

treatment of hyperthyroidism by Dr. B. H. Orndoff (North Chicago Hospital, Chicago). For our equipment the dosage was as follows: Ma., 4; sphere gap, 130; peak, 177; filter 0.25 mm. Cu plus 1 mm. Al; portal 5 × 8 cm.; distance, 50 cm.; time, 55 min.; yielding 385 r units.

The output of Dr. Orndoff's equipment was measured with the radiometer and then our equipment was set for the same output, also with the radiometer. This dosage, repeated three times on successive days, results in a second or third degree burn in man, which is known to be correct. Dr. Orndoff usually treats his patients with the above dosage three or four times, the doses being 21 days apart, which is designated as one series.

Since the evidence in the literature indicates that the dog's normal thyroid is quite resistant to radiant energy, we decided to give four doses, from 7 to 14 days apart, which we called a series. So the term "series," as we use it, means the above dose of X-rays given four times, 7 to 14 days apart.

The blood calcium was determined at intervals throughout the experiment.

Four different types of experiments were planned. In *Experiment I,* three series, four doses each, were given, the time between the first and second series being four months, and between the second and third being one month, the dogs being observed for nine months. In *Experiment II,* one series was given and the thyroid examined at four months after completion of the series. In *Experiment III,* two series were given three months apart. Two months later one thyroid was removed, and then, four months later, the other thyroid was removed. In *Experiment IV,* three series were given, the time between Series 1 and Series 2 being one month and between Series 2 and Series 3 being three months. One thyroid lobe was removed between the second and third series. These different experiments were planned with the idea that different effects might occur. Two dogs were used in each series.

RESULTS

Changes in Parathyroids.—Table I shows the average blood calcium values for the various dogs. It is to be noted that only two of the seven dogs showed a decrease after the first series, a decrease that is quite small. All dogs showed a decrease after the second series. The amount of the decrease was not sufficient to cause disturbances due to low blood calcium, the greatest decrease being 2.4 mg.—from a high level of from 13.0 to 10.6 milligrams. A significant change in blood calcium occurred in Dog 4, which received excessive radiation to the point of ulceration. In this dog the parathyroid was histologically hyperplastic but contained an abnormal amount of connective tissue stroma and its capsule was much thickened. Dog 8 also showed a significant decrease in blood calcium, but it must be kept in mind that he had lost two parathyroids.

The results on blood calcium clearly show that although the X-rays caused a hyperplasia of the parathyroids, the hyperplasia did not result in increased blood calcium; but the blood calcium decreased slightly in spite of the hyperplasia.

The results in Dogs 7 and 8 further show that the X-rays administered prevented compensatory hyperplasia only to a slight degree following removal of two parathyroids. It did prevent some compensatory hyperplasia, since the parathyroids in Dogs 7 and 8 were not as large as those in Dogs 5 and 6, which did not receive the third series. The greater amount of connective tissue in the parathyroids of Dogs 5 and 6 than in Dogs 7 and 8 was probably due to the difference in time since the last X-ray exposure.

Thyroids.—Only the histology of the thyroid was studied. All dogs, to start with, had small thyroids. The dogs received a diet of cooked yellow corn meal, bone soup, and baker's whole wheat and white bread.

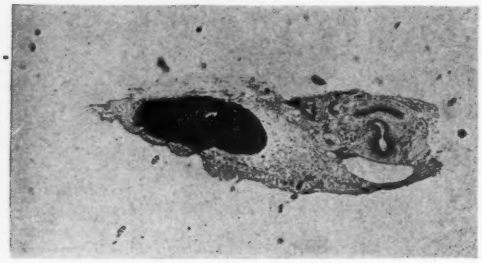


Fig. 1. Showing the normal parathyroid of a dog of average size, magnified 11 times.

Biopsy was not performed before X-ray treatment was instituted because we did not want to introduce changes incident to the operation. But in Dogs 5, 6, 7, and 8 we did have a control picture of the thyroid after two series of X-ray therapy. In this group of dogs the thyroid presented a normal histological appearance after X-ray treatment with the exception of Dog 6. In this dog the thyroid was slightly hyperplastic after the second series, and after the third series it showed greater or unmistakable hyperplasia. So the X-rays produced in this group either no change or a hyperplasia; however, one might expect some compensatory hyperplasia after the removal of one lobe of the thyroid, as was done in these dogs. In Dogs 2 and 4, which suffered skin burns, the capsule of the thyroid was definitely thickened. This did not occur in the other dogs. The gland of Dog 1, which received three series, was hyperplastic. None of the thyroids were grossly larger than normal, and even those which showed hyperplasia histologically were of normal size.

Epilation, or disappearance of the hair, of the exposed neck was present in all dogs.

These results show that the normal thyroid of the dog is highly resistant to X-rays, the only detectable effect being a tendency towards hyperplasia. Thickening of the thyroid capsule occurred only when skin burns occurred, with edema of the neck.

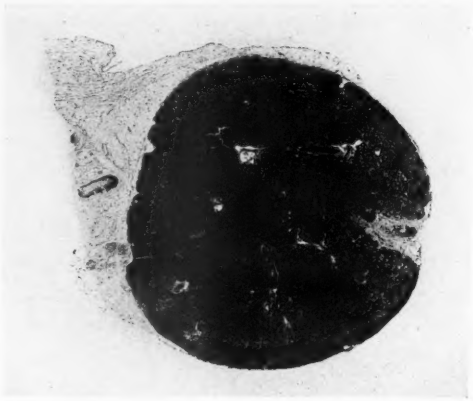


Fig. 2. Showing one of the hyperplastic parathyroids of Dog 5, measuring 3 × 2.8 mm. after fixation, magnified 11 times.

PROTOCOLS

Dog 1.—Received first series between May 20 and June 11, 1929; second series between Nov. 13 and Dec. 13, 1929: third series between Jan. 20 and Feb. 24, 1930: killed, April 2, 1930.

Histology.—Three series. *Thyroid:* hyperplasia. No increase in connective tissue. *Parathyroid:* epithelial hyperplasia without increase in stroma or blood vessels. The hyperplasia is not as marked as in Dogs 5, 6, 7, and 8.

Dog 2.—Same series as Dog 1. During the first dose of Series 1, the distance was 30 cm. instead of 50 cm. for 20 minutes. Killed, April 2, 1930. There was a second degree burn of the neck. The thyroid was grossly edematous.

Histology.—Three series (more dosage). *Thyroid:* capsule thickened; hyperplasia. *Parathyroid:* epithelial hyperplasia, with increase in stroma to the point of lobulation.

Fig. 3. Showing the microscopic structure of the normal parathyroid of a dog, magnified 165 times.

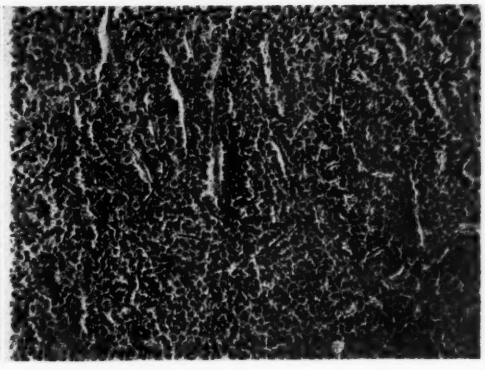


Fig. 4. Showing the microscopic structure of the hyperplastic parathyroid of Dog 5, magnified 165 times. Note the dense epithelial cords. No oxyphilic cells found.

Dog 3.—Dog died of distemper five days after third dose of Series 1.

Histology.—Parathyroids: epithelial cords shrunken and loosened from stroma; some degeneration of cells (probably (?) postmortem change). *Thyroid:* normal.

Dog 4.—Received first series between May 29 and June 20, 1929. During second dose of first series the filter was left out for 40 minutes. Died, Oct. 2, 1929. X-ray burn, third degree, of neck. Lobes of the thyroid were very hard or firm and small.

Histology.—Parathyroids: epithelial cords much shrunken; considerable increase in connective tissue stroma. Greater histological change than in other dogs. Capsule very thick (approximately 1 mm.). *Thyroid:* areas throughout section showing definite hyperplasia. Not much colloid in gland. Questionable increase of connective tissue about blood vessels. Capsule much thickened.

Dog 5.—Received first series between June 20 and July 18, 1929: second series between Oct. 16 and Nov. 5, 1929. Right thyroparathyroidectomy, Jan. 11, 1930. Killed, April 2, 1930. Parathyroids appeared to be larger than normal.

Histology.—Two series—right thyroparathyroidectomy by operation. *Thyroid:* normal. *Parathyroid:* there is definite hyperplasia but not quite as much as in Dog 6, with a slight increase in connective tissue. Three series—left thyroid parathyroidectomy. *Thyroid:* normal. *Parathyroid:* marked hyperplasia present. The fixed gland measures 3×2.8 millimeters. There is some increase in vascularity, also in connective tissue.

Dog 6.—Received first series between June 20 and July 18, 1929: second series between Oct. 16 and Nov. 5, 1929. Right thyroparathyroidectomy, Jan. 11, 1930. Killed, April 2, 1930. Parathyroids appear to be larger than normal.

Histology.—Right thyroid parathyroidectomy by operation. Two series. *Thyroid:* slight hyperplasia, little colloid. *Parathyroid:* there is a definite hyperplasia, with an increase in connective tissue.

Dog 7.—Received first series between July 17 and Aug. 9, 1929: second series between Sept. 11 and Nov. 1, 1929. Right thyroparathyroidectomy Nov. 8, 1929. Received third series between Dec. 26, 1929, and Jan. 14, 1930. Dog died of distemper Feb. 4, 1930, 20 days after last dose.

Histology.—Gross hyperplasia of parathyroids. Two series. Right thyroid parathyroidectomy by operation. Two series. *Thyroid* is normal. *Parathyroid* shows definite hyperplasia, without connective tissue change. Three series. Left thyroparathyroids were only slightly hyperplastic. Thyroid normal in size and normal histologically except for a small area of hyperplasia. Parathyroids were

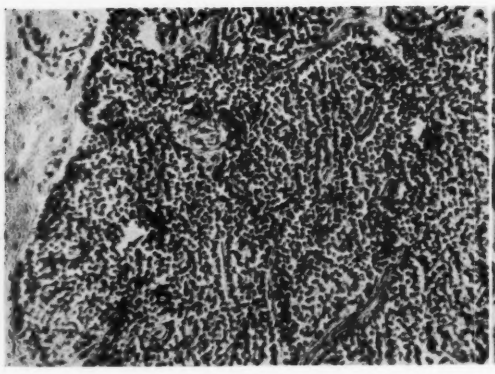


Fig. 5. Showing the hyperplastic parathyroid of Dog 2, magnified 165 times. Note connective tissue increase. This dog received excessive radiation.

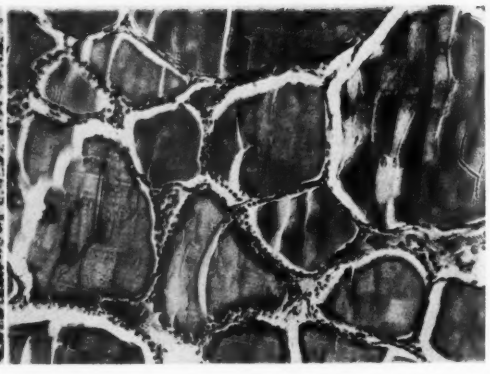


Fig. 6. Showing the thyroid of Dog 7, which is quite normal, magnified 165 times.

larger than normal, but not as large as in Dogs 5 and 6.

Dog 8.—Same series as Dog 7. Removed left lobe of thyroid March 15, 1930, two months after last dose.

Histology.—Gross hyperplasia of parathyroids. Two series. Right thyroparathyroidectomy by operation. *Thyroid* is normal. *Parathyroid* shows definite hyperplasia (more intensely than in Dog 7). Three series. Left thyroparathyroidectomy (after third series). *Thyroid* is normal. *Parathyroid* is larger in size than that found on the right side. It is definitely hyperplastic and appears to be more vascular. This confirms gross findings. It was not as large as in Dogs 5 and 6.

DISCUSSION

It is quite apparent from this work that the normal thyroid of the dog is quite resistant to X-rays and degenerative changes are not caused by the dosage used, which is a dose known to be of some clinical value. It does not follow from this work, which confirms other reports in the literature, that X-rays would have no effect on the hyperplastic thyroid gland of man. According to Warthin (8), the most constant and striking feature of exophthalmic goiter is the hyperplasia of the primitive lymph nodes of the thyroid. It is well known that lymphoid tissue is especially sensitive to X-rays. Hence, X-rays would at least destroy the lymphoid tissue of the hyperplastic thyroid, if nothing else, and one would be able only with difficulty to detect such an effect in the normal thyroid. So we are still confronted with the problem of the effect of X-rays on the hyperplastic thyroid gland, a problem which we are now investigating in the oppossum, in which animal experimental hyperplasia of the thyroid can be easily produced.

It is also quite apparent from the experimental results that X-rays in the dosage used do not cause extensive proliferation of connective tissue. If a burn is produced, or if the treatment is excessive, then there results a thickening of the capsule.

It is interesting that the parathyroids reacted to the X-rays by manifesting hyperplasia. This finding was very definite and unexpected, especially since the blood calcium slowly declined instead of increasing. The only interpretation we can place on this

TABLE I

BLOOD CALCIUM VALUES BEFORE AND AFTER EXPOSURE OF THE THYROID AND PARATHYROID AREA TO X-RAYS

Dog	Normal blood Ca. mg.	After 1st series	After 2nd series	After 3rd series	After removal of 1 thyroid	Remarks
Expt. I						
Dog 1	11.6	11.7	10.6	10.5		
Dog 2	12.5	11.9	11.4	11.4		
Expt. II						
Dog 4[1]	11.3	11.5	(9.3 mg. 3 mo. after 1st series)			
Expt. III						
Dog 5	12.5	11.4	10.6		10.4	
Dog 6	13.0	10.5	11.3		10.5	
Expt. IV						1 thyroid lobe removed between 2nd and 3rd series
Dog 7	11.2	11.0	10.4			
Dog 8	11.4	10.6	10.3		9.9[2]	

[1]This dog had more X-ray dosage than the others because of an accident. However, his parathyroid was histologically hyperplastic and contained excessive connective tissue stroma. This dog had four parathyroids.
[2]This dog also showed considerable connective tissue stroma in addition to hyperplasia. He had only two parathyroids, the other two having been removed after the second series.

finding is that hyperplasia of the parathyroids does not necessarily mean hypersecretion.

SUMMARY

1. The histology of the normal thyroid of the dog was not materially changed by an X-ray dosage known to be of clinical value in some cases of hyperthyroidism. The tendency of the effect was in the direction of hyperplasia.

2. The capsule of the thyroid was thickened only by overdosage which resulted in a skin ulcer.

3. The treatment used caused a definite hyperplasia of the parathyroids. In those dogs in which several months had elapsed after cessation of the treatment an increase in connective tissue of the parathyroids occurred. A gradual slight decrease in blood calcium occurred in spite of the hyperplasia.

4. It is pointed out that these results do not necessarily apply to the hyperplastic thyroid of Graves' disease, which is a different problem. The results indicate that the clinical dosage used in the treatment of hyperthyroidism will not injure the parathyroids.

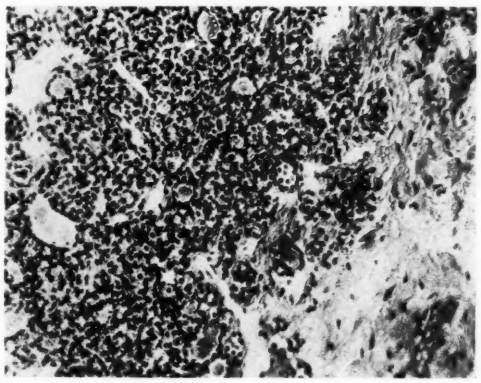


Fig. 7. Showing the hyperplastic thyroid of Dog 2, magnified 165 times. Note increased thickness of capsule due to excessive radiation.

BIBLIOGRAPHY

(1) KRAUSE, PAUL, and ZIEGLER, KURT: Fortschr. a. d. Geb. d. Röntgenstr., 1906-7, X, 126.

(2) RAVE, FRANZ: Ztschr. f. Röntgenkunde u. Radiumforschung, 1911, XIII, 37-53, 96-121.

(3) PFEIFFER, C.: Beitr. z. klin. Chir., 1906, XLVIII, 367.

(4) FIORENTINI and LOURASCHI: La Practica Otorino-laringoiatrica, 1905, No. 5.

(5) Bower, J. O., and Clark, J. H.: Am. Jour. Roentgenol. and Rad. Ther., August, 1923, X, 632.
(6) McCord, Carey P., and Marinus, Carlton J.: Endocrinology, 1918, II, 289.
(7) Schaedel, Wilhelm: München. med. Wchnschr., Sept. 1, 1922, LXIX (2), 1282.
Perthes, J.: Strahlentherapie, 1923, XV, 695.
Pfahler, George E., and Zulick, J. D.: Am. Jour. Roentgenol., February, 1916, III, 63.
Craver, L. F.: Ann. Surg., December, 1925, LXXXII, 833.
(8) Warthin, A. S.: Ann. Int. Med., December, 1928, II, 553.
(9) Coulaud, E.: Compt. rend. Soc. de biol., 1922, LXXXVII, 1014.

Roentgen Examination in Technical Fields. Kantner and A. Herr. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 873.

The importance, the educational value, the methods, and results of technical roentgen examinations in industry and also their costs are reported. When not only the finished products are radiated but also raw material and semi-finished pieces, one may save considerably by early elimination of faulty material before the completion of processes of manufacture. Repeated examination may show the engineer the causes of faults.

X-rays are used for examination of material, investigation of structure (by obtaining interference effects similar to spectra of crystals), and chemical analysis (by analysis of absorption and emission of characteristic radiation). The latter, so far, is entirely in its experimental stage, but the former two have gained considerable importance. The paper is well illustrated and worth while reading in detail.

Hans A. Jarre, M.D.

CASE REPORTS

TUMOR INVOLVING LYMPHOID TISSUE

CASE REPORT

By DONALD S. CHILDS, M.D.,
Associate Professor of Radiology and Osteology, College of Medicine, Syracuse University, Syracuse, New York

Stimulated by the article entitled "Lymphoblastoma Involving the Stomach—Roentgenologically Considered," by Howard E. Ruggles, M.D., and Robert S. Stone, M.D., in *California and Western Medicine*, July, 1930, the following case is reported.

The patient, A. V. P., aged 42, an optician, was admitted August 25, 1929, to the Syracuse University Hospital of the Good Shepherd, and gave the following history: Had never had any illness from childhood until December, 1926, when he was taken with a hard cold in the head and chest. Was ill about six weeks. In December, 1927, his left ear drum ruptured, followed by a discharge of two weeks' duration. His best weight had been 170 pounds, in December, 1926; his average weight was 150 pounds. Patient had had "grippe" a year and a half before the present examination and a cold of a month's duration, during which time he coughed and expectorated some thick mucus, with no fever or pain during the cold. During the "grippe" attack he had slight fever, sinus trouble, an ear abscess, no nausea nor vomiting. The fever was not high, but fluctuated. He had profuse perspiration; no hemoptysis.

PHYSICAL EXAMINATION

Physical examination by Dr. Ellery Allen showed blood pressure 95/55.

Skin: Slightly pale; no eruption.

Head: No sinus tenderness.

Fig. 1. Radiograph of stomach.

Eyes: React to light and accommodation; no nystagmus, ocular palsies, lid lag, or exophthalmia.

Ears: No mastoid tenderness. Left ear drum ruptured. No discharge.

Nose: Septum slightly deviated to left.

Mouth: Several missing teeth. Mucous membrane slightly pale. Tonsils considerably enlarged and cryptic; not acutely affected.

Neck: Adenopathy considerable; anterior and posterior cervical glands enlarged but not tender.

Chest: Expansion good and no dullness, râles, abnormal breath sounds, nor fremitus changes. Heart not enlarged; rate, 80; sounds of fairly good quality; no arrhythmia, thrill, nor murmurs.

Abdomen: Rather tense and has a "doughy" feeling. No spasm, rigidity, definite tenderness. Some distention is present.

Can make out no fluid wave, but there are places in the abdomen where fluid seems to be directly under the examining finger and its displacement can be heard. The spleen is easily palpable and appears to be considerably enlarged, firm, and non-tender. The liver edge can be felt—smooth and firm, non-tender. Just above the umbilicus can be felt a small, firm, irregularly shaped mass the size of a marble. Deep in the right upper quadrant can be felt two or three of these nodular, non-tender masses, all in a group. I doubt if fluid is present in the peritoneal cavity, unless it be in small, walled-off spaces. No costovertebral tenderness.

Extremities: Deep reflexes are active. No edema or clubbing.

Bones and joints: Essentially negative.

Glands: Cervical, axillary, inguinal, and epitrochlear glands are enlarged and palpable; non-tender.

Rectal: Prostate not enlarged nor tender. No masses felt. A few small external hemorrhoids.

LABORATORY FINDINGS

Wassermann: Negative.

Examination for typhoid: Blood, negative; no organisms of the typhoid, paratyphoid, nor dysentery groups isolated in feces.

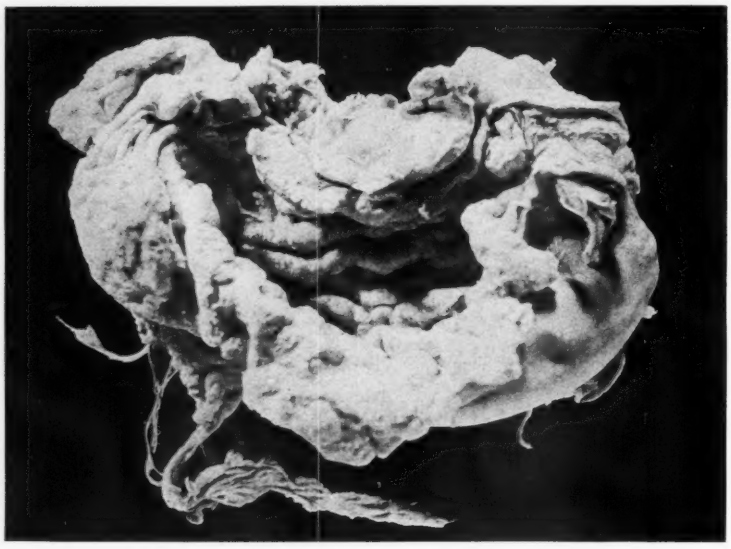


Fig. 2. Gross specimen of stomach opened.

On August 29, 1928, an epitrochlear gland, left, was removed.

Clinical diagnosis: Tuberculosis or Hodgkin's disease.

Pathological diagnosis by Dr. H. G. Weiskotten: Lymphosarcoma, possibly of type of aleukemic leukemia.

Left axillary glands removed September 6, 1928, questionable for cancer.

Pathological diagnosis by Dr. H. G. Weiskotten: Lymphosarcoma, possibly of type of aleukemic leukemia.

Proctoscopic examination by Dr. M. A. Cain, September 7, 1928: Probably cancer.

X-RAY EXAMINATION (SEPTEMBER 10, 1928)

Marked evidence of deformity of the stomach and transverse colon involving the

body of the stomach. This I should regard as evidence of malignancy.

Lung fields: The lung fields do not show evidence of metastasis. The markings are not particularly characteristic.

Barium enema, September 17, 1928, shows non-filling of transverse colon while up to that point there is no evident change in lumen nor hesitation of the clysma. The barium filled the cecum well.

GASTRIC ANALYSIS

Fasting contents: Free HCl, 0; total acidity, 8 per cent.

Test meal: free HCl, 0; total acidity, 9 per cent.

Urine was essentially negative.

Blood:

	August 8, 1928	August 27, 1928	September 11, 1928
Hemoglobin	45%	.....	60%
Red blood count	3,020,000	.....	4,300,000
White blood count	5,600	6,400	5,400
Polymorphonuclears	50%	52%	55%
Lymphocytes	45%	41%	40%
Large mononuclears	5%	6%	3%
Eosinophiles	0	1	1
Basophiles	0	0	1
Smear	Evidence of secondary anemia.	Shows secondary anemia.	Shows second degree anemia; no pathology; w. b. c.

AUTOPSY FINDINGS

Autopsy performed October 29, 1929, by Dr. J. H. Ferguson.

(A. V. P., male, white, age 42 years.) Body is that of a fairly well developed, very poorly nourished adult male 168 cm. long, weighing 115 pounds. Rigor mortis is moderate. Liver mortis is moderate in the dependent portions. Scalp, ears, nose, and mouth are negative. Pupils are rather markedly dilated, and equal. The anterior and posterior cervical glands and the submaxillary, axillary, and inguinal glands are palpable and apparently somewhat enlarged. There is a small, healing scar in the left axillary region.

Peritoneal cavity: Peritoneum is smooth and glistening. Cavity contains approximately 200 c.c. of rather thick, grayish-white fluid. Diaphragm extends to the fourth interspace on the right, fifth rib on the left. There are no adhesions between the liver, spleen, and diaphragm. Foramen of Winslow is apparently closed, due to numerous enlarged lymph nodes. Lesser peritoneal cavity is practically obliterated by large tumor masses, which are apparently retroperitoneal. Appendix is considerably larger in diameter than usual. The blood vessels of the serosa are somewhat injected. The lower portion of the ileum is apparently considerably thickened. Numerous grayish areas of thickening of the wall along the free margin of the ileum may be seen and palpated. The upper portion of the rectum and the sigmoid colon are firmly matted together in the true pelvis and are apparently involved in a large tumor mass which occupies a major portion of the pelvis. The wall of the entire colon and cecum seems to be considerably thickened. In the right upper quadrant, near the region of the hepatic flexure, there is a rather sharp angulation of the transverse colon. This is apparently caused by adhesions of the peritoneum and numerous large yellowish-brown nodules which are apparently lymph nodes. Stomach is apparently markedly dilated. The stomach wall is much thicker than usual and seems by palpation to be somewhat nodular. The lymph nodes in the greater and lesser omentum and along the greater curvature of the stomach are enormously enlarged and

vary in size from 1 to 3 cm. in diameter. The lymph nodes along the large intestine are also considerably enlarged. The mesenteric lymph nodes are enormously enlarged and vary in size from 1 to 3 or 4 cm. in diameter. Along the base of the mesentery there is a large retroperitoneal mass which is apparently made up of numerous small masses. This mass is approximately from 6 to 8 cm. in diameter and displaces the gastro-intestinal tract anteriorly. All of these masses on section are found to be yellowish and grayish-white in color and are apparently lymph nodes.

Pleural cavities: The left pleural cavity contains approximately 150 c.c. of rather thick grayish-white fluid, resembling the fluid found in the peritoneal cavity. The right cavity contains no free fluid. There are no adhesions.

Mediastinum: The lymph nodes of the mediastinum are slightly enlarged. The substernal lymph nodes are considerably enlarged and on section resemble those in the peritoneal cavity.

Pericardial cavity: Cavity contains from 8 to 10 c.c. of clear straw-colored fluid.

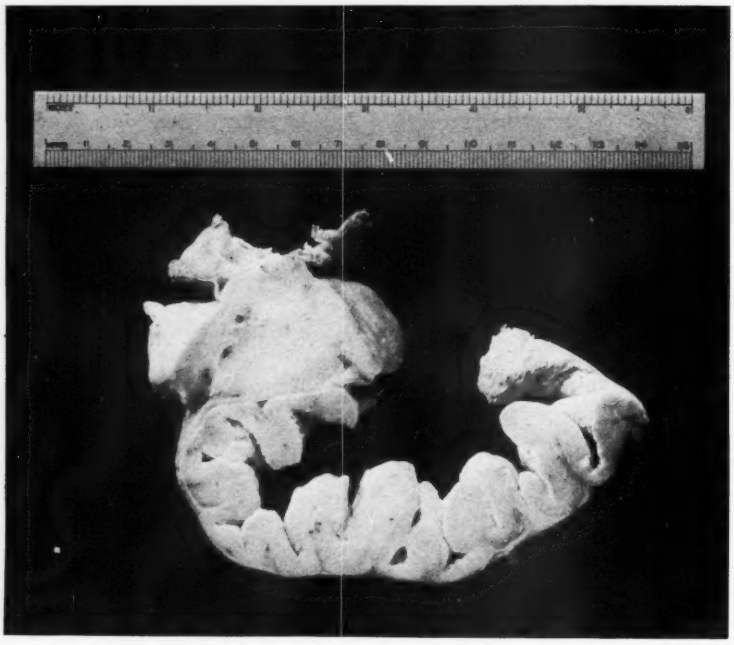


Fig. 3. Section of stomach through tumors.

Pulmonary artery opened *in situ* is without evident lesion.

Heart: Weight 200 grams. It is apparently much smaller than usual. There is considerable edema of the visceral pericardium. Cavities contain a moderate amount of fluid blood and blood clot. Valves are without evident lesion. Coronary arteries are without evident lesion. Myocardium is reddish-brown in color. Markings are distinct.

Lungs: Weight of left, 250 grams; of right, 240 grams. Both lungs are crepitant throughout. In the apex of the right lung there is a small area from 1 to 2 cm. in

diameter in which the pleura shows some grayish thickening. Beneath this thickening may be seen a few small grayish-white nodules, pin-point to pin-head in size. On section, the lung substance is found to be reddish-gray in color. On pressure a very slight amount of reddish fluid may be expressed. Vessels, bronchi, and bronchial lymph nodes are not unusual.

Spleen: Weight 340 grams. On section, the color is found to be rather dark reddish-purple. Pulp is firm. The Malpighian corpuscles are considerably enlarged and in areas tend to be fused.

Liver: Weight 1,590 grams. Surface is smooth and capsule transparent. On section, the liver substance is found to be reddish-brown in color. Markings are fairly distinct.

Gall bladder and ducts: Gall bladder contains a moderate amount of golden yellow bile. There are no stones. Mucous membrane is without evident lesion. The common bile duct passes through a mass of apparently enlarged lymph nodes to reach the duodenum. There is apparently no obstruction.

The entire gastro-intestinal tract, kidneys, aorta, and organs of the pelvis were removed *en masse*.

Gastro-intestinal tract: The mucous membrane of the esophagus is studded with numerous grayish-white areas, apparently hypertrophied lymphoid tissue. The wall of the stomach is markedly thickened, which thickening apparently involves the entire wall. There is marked hypertrophy of the rugæ, so that in many instances they are from 1 to 2 cm. in thickness. On section through these rugæ they are found to be light yellowish-gray in color and soft in consistency. Scattered throughout the stomach wall are rather numerous masses which are apparently beneath the mucous membrane. There is no evidence of ulceration. The largest of these masses is from 4 to 5 cm. in diameter and from 1 to 2.5 cm. in thickness. The pylorus is widely patent. The wall of the first part of the duodenum is considerably thickened, with no evident tumor formation. In the ileum the Peyer's patches are markedly enlarged and thickened. The solitary lymph nodules of the

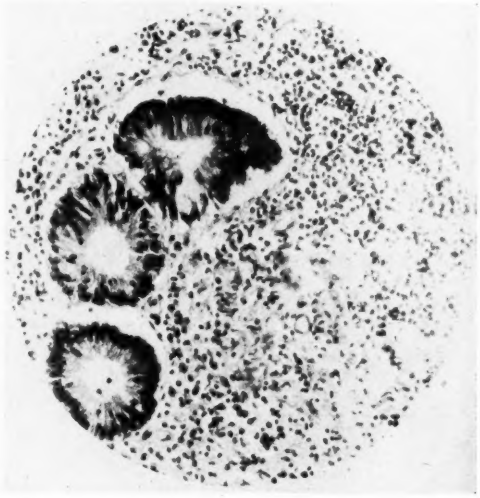


Fig. 4. Photomicrograph through tumor × 200.

lower ileum stand out as masses from 0.2 to 0.5 cm. in diameter. The solitary lymph nodules of the large intestine are enlarged to the same degree, so that the entire mucous membrane of the large intestine is covered with nodules which are somewhat polypoid in character. In the sigmoid colon there is considerable generalized thickening of the entire wall in addition to the hypertrophy of the solitary lymph nodules. The pancreas seems to be entirely surrounded by what are apparently enlarged lymph nodes. There is no evidence of infiltration into the pancreas. The kidneys are not unusual on external examination; on section, the color is found to be a rather dark reddish-brown. Markings are fairly distinct. The pelves and ureters are not abnormal. The aorta is without evident gross lesion. The remainder of the mass is apparently made up of compact

masses of fairly discrete nodules which are apparently enlarged lymph nodes.

ANATOMICAL DIAGNOSIS

Apparently malignant tumor involving the lymphoid tissue of the entire body. Possibly some pulmonary tuberculosis.

This case is reported by the Radiological Department of the Syracuse University Hospital of the Good Shepherd and appreciation is expressed to the medical, surgical, laboratory, and pathological services for their co-operation in making the presentation possible.

INTUSSUSCEPTION

CASE REPORT

By CLARENCE E. WEAVER, M.D.,
DETROIT, MICHIGAN

Fig. 1. Five-hour examination showing terminal ileum apparently entering dilated cecum and ascending colon.

Intussusception occurs clinically in two forms—the acute type, which is seen mostly in male infants—more than half occur before the age of one year—and the chronic form, which is more common in men between the ages of 20 and 40 years. The causes are irregular peristalsis (sometimes induced by worms), diarrhea, polypoid tumors, or other forms of irritation. Brown and Sampson mention intussusception as a complication of intestinal tuberculosis, and cite two cases. Keen's "Surgery" gives nonmalignant tumors, usually pedunculated, mostly in adults, as a not infrequent cause, and states that Weiss in his study of the literature referred to sixteen such cases. A subserous lipoma of the cecum was responsible for invagination in a case of Marchand's. Keen also states that ulcers of the bowel have been found as a cause—as in dysentery and tuberculosis—and cites such a case reported by Orten.

On account of the comparative rarity of chronic intussusception in adults, and the fact that case reports of such pathology are not numerous, the following case is considered worthy of report.

Mrs. J. G., age 40 (seen January 8, 1929), had been suffering from marked constipation for several years. Since December, 1928, she had complained of eructations of gas, associated with cramps, flatulence, and small nodular stools. No loss in weight.

Physical examination.—Negative, except that the abdomen was more than normally tympanitic, especially on the right side. No palpable masses. Blood and urine examination essentially negative.

X-ray examination (January 8, 1929).—No organic pathology of the stomach or duodenum was seen. No spasm was noted. Emptying was normal. The five-hour examination showed most of the meal in the terminal ileum, with a small amount in the ascending colon. The terminal ileum was not dilated. The ascending colon was mod-

Fig. 2. First barium enema. No filling defect is present. The caliber of the colon is normal.

erately dilated. The terminal ileum could be seen to pass within or behind the lower part of the ascending colon. This might be due to intussusception, or possibly to an old inflammation about the cecum and ascending colon, with bunching of these parts by adhesions. The twenty-four-hour examination showed a ring outline in the middle of the transverse colon, suggesting displacement of barium by a round smooth mass, possibly a benign tumor. The colon was dilated proximal to this, the caliber being considerably smaller on the distal side.

The barium enema passed readily to the middle of the transverse colon, was momentarily arrested here, a suggestion of filling defect was seen, which then disappeared, the enema passing on to the cecum, filling the entire colon normally and showing a normal caliber throughout. No filling defect of the transverse colon was demonstrable

Fig. 3. Condition immediately after evacuation of the first enema. Large smooth filling defect in middle of transverse colon, with dilated bowel on proximal side and collapsed bowel distal to it.

by manipulation of this area. After evacuation of the enema, the filling defect of the tranverse colon was again present, with the change in caliber at this point as noted at the twenty-four-hour observation.

At a later X-ray examination (March 13, 1929), a barium enema was entirely obstructed at the middle of the transverse colon, and a smooth central defect was easily seen before and after evacuation of the enema. These X-ray findings suggested intussusception or possible benign tumor of the transverse colon, causing partial obstruction.

Operation by Dr. C. D. Brooks, Dr. W. R. Clinton, and Dr. L. B. Ashley (March 16, 1929) showed intussusception of the cecum, terminal ileum, and hepatic flexure into the transverse colon. This was reduced without traction, and a large, apparently smooth encapsulated tumor about 2½ inches in diameter was found in the cecal wall near the ileocecal junction. There was no involvement of the ileocecal glands, or glands of the mesocolon. Ileocolostomy was done, with the usual lateral anastomosis in the transverse colon to the lower part of the ileum, at least 8 inches from the ileocecal valve.

At a second operation (April 23, 1929) the terminal ileum, cecum, ascending colon,

Fig. 4. Enema, two months later, showing large filling defect in transverse colon, with almost complete obstruction to the enema at this point.

and right half of the transverse colon were resected, with the end of the ileum and colon inverted with three purse-string sutures.

Laboratory report by Dr. P. F. Morse (April 26, 1929).—Chronic inflammation and ulceration of the large intestine. No malignancy was found.

At the present writing, October 15, 1930, the patient is entirely well.

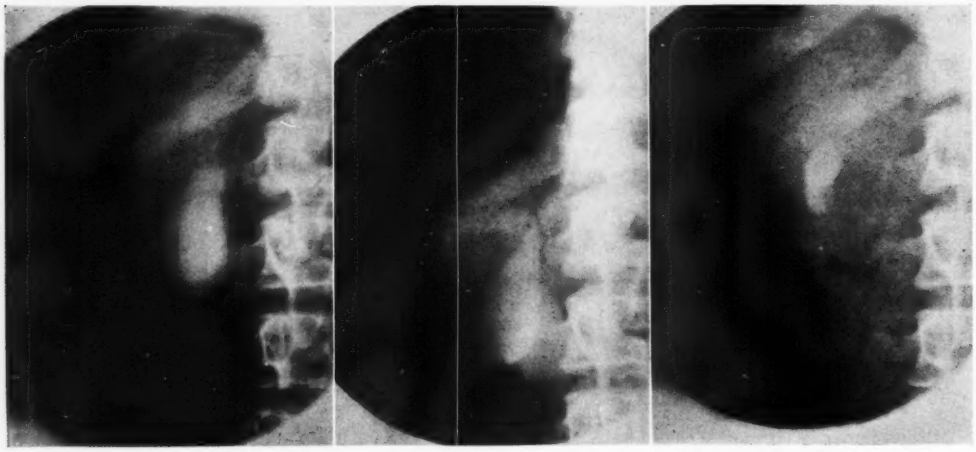
This case is interesting in that it illustrates some of the typical signs of chronic intussusception, and yet presents some confusing aspects which tend to render the diagnosis of these conditions difficult, especially as they are not commonly encountered. It is interesting to note that the intussusception was reduced by the first enema, and immediately recurred with evacuation, and that the same type of examination two months later showed practically complete obstruction to the enema, with a well marked filling defect.

DOUBLE GALL BLADDER, WITH DOUBLE CYSTIC DUCT

CASE REPORT

By RICHARD HAYES, M.D.,
LONGVIEW, WASHINGTON

The patient, a male of 35, with rather in-



Figs. 1 and 2. Films taken at intervals of 13 and 16 hours, respectively, showing two gall bladders. (*See page 67.*)

Fig. 3. Film taken at interval of 19 hours, after the so-called fat meal.

Figs. 4 and 5. Films taken after a subsequent intravenous administration of dye.

definite gastro-intestinal symptoms, was referred for complete roentgen examination.

The gall-bladder dye was first administered orally, giving us the films shown in Figures 1, 2, and 3, taken at intervals of 13, 16, and 19 hours, respectively. The film shown in Figure 3 was taken after the so-called fat meal.

As a matter of interest, the dye was again given after a few days, this time intravenously, with the resultant change in position of the gall bladders, as seen in the films reproduced in Figures 4 and 5. There was no dye left this time after the fat meal.

There is hardly any doubt but that we have here two gall bladders, which we consider normal ones, with two long independent cystic ducts. In Figures 1 and 2, the organs seem to swing in line with one another, while in Figures 4 and 5 the uppermost gall bladder appears to swing outward and the lower one to fold upward.

A continuation of the examination has shown that the patient has a duodenal ulcer, for which he is being treated medically.

Dr. Sherwood Moore was kind enough to review the films and diagnosis in this case.

EDITORIAL

M. J. Hubeny, M.D. . . . . *Editor*
Benjamin H. Orndoff, M.D. . *Associate Editor*

Contents of RADIOLOGY copyrighted by the Radiological Society of North America.

ROENTGENOLOGY AND INTERNSHIP

The increase in the number of accessories to diagnosis and treatment in medical practice has been so rapid as to bewilder the average old-time practitioner. He has been too busy to withdraw from his work regularly to pursue the graduate work which might have aided him in keeping abreast of the times. Medical journals are coming to convey medical ideas in language which he can barely understand and meagerly comprehend. His armamentarium is becoming as obsolete as his saddlebags. He views with cynicism the novel ways of the new competitive medical recruit. In efforts to justify himself, he casts insidious reflections upon the efforts of his rival novice to establish in practice a system of scientific research and clinical pursuit.

Among other essential aids to the successful practice of medicine, radiology has attained a well established place. Its reception by the profession and the laity was less hampered than was that of some other now accepted adjuncts to practice. The appeal to the sense of sight gave a rational impression, which readily appealed to clinicians in legitimate practice as well as to the eager mercenary observers on the side lines. Commercial enterprises soon recognized the portent of this accessory and proceeded to develop all types of apparatus. Being manufactured, they needed to be sold, and strenuous efforts were made profitably to dispose of the various electrical machines. Thus was established another of the many anomalous situations so frequently observed in the evolution of medical science—a commercial world foisting its hypothetical and unproven products upon a scientific profession. Ere long medically trained mechanists developed more rational and serviceable apparatus.

Again, crafty tradesmanship produced machines faster than medical education could develop qualified operators. The obvious outcome was poor clinical results under legitimate management and dreadful results under the reckless direction of unscrupulous exploiters. Laws and administrative means of control became imperative. Inasmuch as a license to practise medicine carries with it a right to use any legitimate measure which will benefit the patient, every such licensed person was permitted to buy an X-ray outfit and proceed to experiment with it on patients. Eventually, out of intelligent research work a standard of technic has been developed which every operator now should know. Gross experimentation should no longer be tolerated even under the cautious tactics of untrained physicians, and much less under the careless commercialism of illegal practitioners. Professional ethics now rightly demand skillfully trained clinical technicians and experienced interpreters in this important medical procedure.

In the State of Pennsylvania, when the intern law was passed in 1914, there could be found barely two dozen relatively competent roentgenologists to man the labora-

BUNDY ALLEN, M.D., Tampa, Florida, President of the Radiological Society of North America

tories in the hundred hospitals required for intern training. In the larger cities of the State several eminent leaders in this field were made chiefs in all the best institutions. With the divided responsibilities of such a number of laboratories, none received adequate attention. Non-medical technicians were employed to take films and turn them into the chief's private laboratory. Reports and bills came from his office without question or control. This procedure needed to be changed because of the following conditions:

(*a*) Requisitions were limited, inasmuch as the staff physicians were suspicious of the value of the films taken by a lay-technician. Prompt reports could not be expected.

(*b*) Staff chiefs could not readily view the films, not having easy access to the opinion of the consulting roentgenologist.

(*c*) Plates were not filed in the hospital for future protection of the hospital and staff. Subsequent study of cases was not practicable.

(*d*) Fees not being regulated, the unreasonableness of these frequently brought reproach upon all concerned. Suspicions of inordinate fee-exactions were not without foundation.

(*e*) The monopolistic attitude of these roentgenologists hampered the development of successors, or the liberal education of other physicians in the value of this specialty.

(*f*) Hospital administrators were urged to furnish equipment, the proceeds of the use of which would go into private coffers. This was not unlike the evolution of the community hospital in earlier days under the energetic promptings of an ambitious surgeon.

A cursory investigation, then, of the conditions present in the hospitals of the State in which internship training might be feasible, revealed the fact that a complete staff-reorganization in most institutions would be necessary. The law implied that the recent medical graduate should have a year of apprenticeship in medicine under supervision. Departmental heads, chiefs of staff departments, needed to be designated, and, in many cases, needed to be supplied. This was particularly true in laboratory management. Search for such specialists frequently was futile; an adequate number could not be found, neither was there evidence of any rapid increase forthcoming.

A demand by the State Board that the X-ray department be headed by a chief who was available throughout a large part of the day to supervise the technical work, to consult with staff physicians, and to direct and teach interns caused a veritable consternation in hospital administration. The requirement, however, readily induced many eager, alert, and adaptable young physicians to seek special training in radiology so as to meet this imperative demand. Now, after sixteen years of intern requirement, we have reason to be proud of our radiological personnel and to be better satisfied with their teaching to interns.

Furthermore, the State Board has always required a sufficient intern training in technic to assure a knowledge of the dangers of the machines, and to assure an abundance of experience in plate reading. It wants every prospective practitioner coming into the State to have a comprehensive knowledge of the value of this adjunct to medicine and wants him to recognize the responsibility one assumes in its hazardous management.

After sixteen years of intern training, more than half of the fourteen thousand physicians licensed in the State have had this apprenticeship service in radiology and thereby are peculiarly prepared to make its service available to their patients. They, also, because of this special training, are cheerful boosters of the physicians who

have so marvelously developed this specialty, while on the other hand they are wise guardians for their patrons against the unscrupulous claims of charlatans. "Learning by doing" is a rule equally as valuable in medicine as in general education, provided it is done under intelligent supervision.

IRVIN D. METZGER, M.D.
Pittsburgh, Pa.
President, State Board of Medical Education and Licensure

IN MEMORIAM

RICHARD MARK BROWN, M.D.

On September 12, 1930, occurred the death of Dr. Brown, of Ogden, Utah, following an operation on September 8 for removal of stone in the common bile duct. Death was due to septicemia and shock.

Dr. Brown was born in Ogden April 17, 1884, the son of Mr. and Mrs. Richard T. Brown, and the grandson of J. J. Murphy, M.D., a prominent pioneer Utah physician, who arrived in that State from Georgia in 1869. Dr. Brown studied medicine at the University of Utah and Columbia University, being graduated from the latter in 1912. He interned in the New York Postgraduate Hospital, to which institution he returned for special training in roentgenology after his service in the World War. In recent years he has confined his practice to roentgenology in Ogden and Salt Lake City, Utah. He leaves a wife (née Wattis) and four young children.

Dr. Brown was a member of his county and state medical societies, the American Roentgen Ray Society, and the Radiological Society of North America, for the latter serving for several years as Counselor of his State.

Dr. Brown's numerous friends extend their sympathy to his family and experience a sense of loss of a valued co-worker.

WILLIAM B. BOWMAN, M.D.

WILLIAM BURLEY BOWMAN, M.D.

On September 24, 1930, occurred the sudden death of this well-known member of the Society. Dr. Bowman had been active in the matter of preparations for the Annual Meeting, and his loss is keenly felt.

He was born on November 7, 1885, at Martin's Ferry, Ohio, and received his education in Cincinnati and St. Louis. Since 1910 he had practised medicine in Los Angeles, California, his specialization in radiology dating from about 1913. He served in the Army for more than two years during the World War, having the rank of Major, Medical Corps. Dr. Bowman was a mem-

ber of his county and state medical societies, the American Roentgen Ray Society (Vice-president in 1916), the Radiological Society of North America (Vice-president in 1925), as well as various local medical bodies, fraternities, the Masonic order, and country clubs. Dr. Bowman was unmarried. He was the author of numerous papers contributed to medical literature.

"Bill Bowman" was beloved by his associates, and hosts of friends mourn his passing.

PRESTON M. HICKEY, M.D.

Preston Manasseh Hickey, aged 65, Professor of Roentgenology at the University of Michigan, died October 30, 1930, at the University Hospital of a coronary thrombus after an acute illness of about five days' duration, preceded by a prolonged period of disability. In spite of ill health, Dr. Hickey remained active in teaching and administrative work. Realizing the seriousness of his illness, he retained his patience, good nature, and sunny disposition to the very end. He frequently remarked, "Chronic disease limits one's capacity, but why shouldn't I make the best of things as they are? Work, in moderation, requires less energy than lying in bed thinking about one's illness." Literally, he passed to the Great Beyond in the midst of activity. How wonderful!

Dr. Hickey was born December 3, 1865, at Ypsilanti, Michigan, the son of Manasseh Hickey, a noted Methodist minister, and Sarah Bush Hickey. He attended the University of Michigan and received the degree of Bachelor of Arts in 1888; was graduated from the Detroit College of Medicine in 1892, and entered private practice immediately after graduation. He remained in Detroit until 1922, when he was called to the University of Michigan as Professor of Roentgenology, succeeding the late Dr. James G. Van Zwaluwenburg.

He was by nature a diligent student, a

PRESTON M. HICKEY, M.D.

teacher, an organizer, and a master technician. To him is due the credit for the development of the well-known Hickey Cone, which reduced scattered rays to a minimum and gave finer roentgenographic detail. He recognized the potential danger of the X-ray to both operators and patients, and even though Dr. Hickey pioneered in this scientific field his hands and fingers showed no result of atrophy.

Very early in the field of X-ray development he advocated lateral plates on the hip and spine. He was one of the earliest workers in studying X-ray findings in postmortems, thereby eliminating the physiological motor phenomena which are now known to be of considerable importance in the in-

terpretation of films made on living subjects.

He was a master photographer and demonstrated the method of photographing specimens free from shadows.

Before studying medicine he taught biology, and after graduation pathology in the Detroit College of Medicine, and was pathologist to the Woman's Hospital from 1894 to 1901. He was Professor of Roentgenology in his medical alma mater from 1909 to 1922.

He was the roentgenologist of Harper, the Children's, and the Receiving Hospitals, and organizer of the old Detroit Camera Club. He was the great spirit in founding the *American Journal of Roentgenology and Radium Therapy,* of which he was Editor for many years. He was President of the American Roentgen Ray Society in 1906-07.

During the War he was rated as Lieutenant-colonel in the Medical Corps, U. S. Army, and from August, 1917, to January, 1919, was stationed in France as consultant in radiology for the American Expeditionary Forces.

He was the Caldwell Lecturer of the American Roentgen Ray Society at its Kansas City meeting in 1928, at which time he gave a very able lecture on the contributions of the great Caldwell himself. He was President of the American College of Radiology the same year.

Dr. Hickey was a member of the American Medical Association, the College of Surgeons, the College of Physicians, the College of Radiology, belonging as well to many of the local state and county societies, of both Wayne and Washtenaw. It would be useless for us to attempt to list a bibliography of his contributions; his articles have covered a diversified field in radiology and in medical education.

His professional life, as shown by the above enumerated activities, was a very orderly and gradual development. His knowledge of biology, pathology, and photography formed an excellent foundation on which to analyze and interpret the evaluation of recorded densities, as shown in health and in disease, and how the bombarding electrons liberate electro-magnetic waves which affect the living cells of plants and animals, including the genus *homo.*

In his experimental work, he was quick to adopt new ideas and uncanny in estimating their scientific worth, the results of which he passed on either in articles or verbally to his confrères—always done with an altruistic spirit. A selfish motive was absolutely foreign to his ultra-scientific approach. His entire life was devoted to elevating the plane of roentgenology in America and to placing it on a par with the other specialties. In his address as President of the American Roentgen Ray Society in 1907, he said: "Broadly speaking, the dignity of roentgenology as a separate branch of modern medicine has not been steadfastly upheld; the proper respect is not always accorded to the roentgenologist. The specialist in this branch of the profession should be recognized by his medical brothers as a consultant, and should be treated and remunerated upon that basis."

His influence on students and associates was striking in that he imparted much of his own enthusiasm to their activities. Such a rare quality is indeed a mark of a great leader and teacher. He was recognized by the undergraduate body as a friend—a friend of the young man—and a counselor to the young doctor. To many he extended a helping hand: to none a deaf ear. To those whom he helped, his life will ever be an inspiration.

He contributed many articles on the undergraduate instruction in roentgenology, on post-graduate instruction, and on hospital organization. His ability as an organizer was of a grade rarely found in a physician.

The numerous societies of which Dr. Hickey was an active member will join with his family—his widow, Grace, a daughter, Mrs. True Pattengill, and two sons, Walter Preston and Guy Ransome, all of Ann Arbor—in mourning his loss.

The Radiological Society of North America has been glorified by his membership and his many achievements have added luster to American and foreign roentgenology. In his demise, science has lost an invaluable exponent and the world has lost a friend to man!

ROLLIN H. STEVENS, M.D.
CLYDE K. HASLEY, M.D.

MINNESOTA RADIOLOGICAL SOCIETY

A meeting of the Minnesota Radiological Society was held at the University Hospital, Minneapolis, Minnesota, on October 25, 1930. The following program was presented:

Roentgen Studies on the Onset of Lobar Pneumonia. Walter H. Ude, M.D., Minneapolis. Discussed by George E. Fahr, M.D., Minneapolis.

Childhood Tuberculosis. Malcolm B. Hanson, M.D., Minneapolis. Discussed by Jay A. Myers, M.D., Minneapolis.

Lympho-epithelioma. A. U. Desjardins, M.D., Rochester, Minnesota.

Air Injection in the Diagnosis of Lesions of the Colon. Harry M. Weber, M.D., Rochester, Minnesota.

Roentgen Therapy in Carcinomatous Metastases to Bone. K. W. Stenstrom, Ph.D., and L. G. Erickson, M.D., Minneapolis.

An informal dinner was held at the Town and Country Club, Dr. W. A. O'Brien acting as toastmaster. The Society was honored by the presence of two distinguished guests, Dr. James L. Martin, of Dallas, Texas, and Dr. Bernard H. Nichols, of Cleveland, Ohio. The following papers were presented:

Significance of Small-intestinal Gas in the Diagnosis of Bowel Obstruction. Edward Schons, M.D., St. Paul.

Clinical and Experimental Studies on Intestinal Obstruction. Owen H. Wangensteen, M.D., Minneapolis.

Intravenous Urography. Bernard H. Nichols, M.D., Cleveland, Ohio.

At the business meeting new officers were elected for the coming year, as follows: B. R. Kirklin, M.D., of Rochester, *President;* Gage Clement, M.D., of Duluth, *Vice-president,* and Leo G. Rigler, M.D., of Minneapolis, *Secretary-Treasurer.*

The time and place of the next meeting will be decided by the Executive Committee at an early date.

LEO G. RIGLER, M.D., *Secretary.*

BROOKLYN ROENTGEN RAY SOCIETY

It is with pleasure we announce that the radiologists of Brooklyn, New York, have recently joined together and formed an organization to be known as the Brooklyn Roentgen Ray Society. After several preliminary meetings, the Society came into existence on December 2, 1930, at which time a Constitution and By-laws were adopted.

The officers are as follows: *President,* Charles Eastmond, M.D.; *Vice-president,* William H. Bayles, M.D.; *Secretary-Treasurer,* John J. Masterson, M.D., 401 Seventy-sixth St., Brooklyn, New York.

The Society will meet regularly on the first Tuesday of each month, from October to April.

REGISTRATION IN THE THIRD INTERNATIONAL CONGRESS OF RADIOLOGY

Paris, July 27 to 31, 1931

A written announcement of communications intended for the Congress will have to be sent in before January 1, 1931. A typewritten English, French, or German abstract, not exceeding one printed page (400 words) of each communication should reach the office of the Congress before April 1, 1931. These abstracts will be printed in a volume handed to members before the opening of the Congress.

Each member is entitled to one communication only, the reading of which is not to exceed 15 minutes.

Should the announced communications be too numerous to be all read, the Bureau of the Congress will have the right to limit their number or shorten the time of reading.

A blank form for enrollment will be sent upon request. Members of the various societies of medical radiology wishing to take part in the Congress are requested to fill in and return this blank as soon as possible, together with the sum of 300 French francs as fee for membership.

An exhibition will be arranged in connection with the Congress. Persons or firms wishing to take part in the exhibition will obtain all particulars from M. H. Pilon, Commissary-general of the exhibition, 34, boulevard de Vaugirard, Paris (15), France.

Further information will be forwarded later to all those who have enrolled and sent their fee to the Congress.

Members of the Congress accompanied by members of their families desirous of attending, as adjoined members, the receptions and festivities given during the Congress, will please state on the blank form the number of these persons and pay a fee of 50 French francs for each of them.

Please address all communications and correspondence to the offices of the Third International Congress of Radiology, 122, rue La Boétie, Paris (8), France.

ABBOTT LABORATORIES AND SWAN-MYERS COMPANY JOIN FORCES

In order to enlarge the research facilities and personnel of both companies, to expand the sales organizations and increase the distribution of their ethical pharmaceutical products, the Abbott Laboratories, of North Chicago, Illinois, and the Swan-Myers Company, of Indianapolis, Indiana, have agreed to combine their resources and consolidate their management. This combination brings into one enlarged organization two groups of persons actuated by the same standards in ethics, scientific research, and controlled manufacture.

Alfred S. Burdick, President of the Abbott Laboratories, states that among those to join the active management of the combined companies in North Chicago are R. M. Cain, who will be Vice-president in charge of sales; Edgar B. Carter, Director of Biological Laboratories; O. C. Durham, in charge of pollens and allergy products, A. E. Snyder, C. R. Jackson and others.

The Swan-Myers business was organized in 1909 and has developed a line of ephedrine products, bacterial vaccines, ampules, pollens and pollen extracts and intravenous solutions, dextrose and other ampules, ophthalmic and nasal ointments, glandular and kerakote products and other specialties. Its Ephedrine Inhalant "66" was the first plain inhalant to be accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

E. H. Volwiler, Chief Chemist of the Abbott Laboratories, becomes a member of the Board of Directors; also James F. Stiles, who has been elected Treasurer, and Ed-

mund L. Drach. S. DeWitt Clough becomes Vice-president and F. W. Scheigert, Secretary. The laboratories of the Swan-Myers Company will continue to be operated in Indianapolis until further notice.

ANOTHER MEMBER ELECTED TO PRESIDENCY OF HIS STATE SOCIETY

George C. McElfatrick, M.D., Counselor of the Radiological Society of North America for Delaware, has been elected to the presidency of the Medical Society of Delaware, to take office at the beginning of the year. The other incoming officers are: *First Vice-president,* W. F. Haines, M.D., of Seaford; *Second Vice-president,* C. J. Prickett, M.D., of Smyrna; *Secretary,* W. O. LaMotte, M.D., of Wilmington; *Treasurer,* S. C. Rumford, M.D., of Wilmington.

It is a matter for congratulation that radiologists hold positions of honor in their state societies. It is in such ways that close ties of co-operation between clinicians, surgeons, and radiologists are formed.

ENCOURAGEMENT OF RESEARCH

A grant has been made by the Committee on Scientific Research of the American Medical Association to Dr. Clinton H. Thienes, Associate Professor of Pharmacology of the School of Medicine of the University of Southern California, according to an announcement issued by Dr. William D. Cutter, Dean. The grant of five hundred dollars is for research on the relationship between the mesenteric plexus and ganglia and the mesenteric nerves. Professor Thienes is attacking this problem from the anatomical and pharmacological standpoints. He states that the knowledge of the intestinal nervous system is meager, and that there is much uncertainty among medical men as to what are the anatomical relations and functions of the nerves which go from the central nervous system to the alimentary tract. There is a network of nerve fibers and cells in the wall of the digestive tract which is considered by some scientists to represent the termination of the mesenteric nerves — nerves of a membrane of the abdominal cavity which connects the intestine with the abdominal wall. Other scientists look upon this plexus as an independent nervous system whose function it is to carry on the automatic motor functions of stomach and intestine.

According to Dr. Thienes, the action of drugs upon the intestinal tract frequently does not correspond with the action of the same drugs in other parts of the body. The purpose of these studies is to establish, if possible, an anatomic and physiologic basis for these differences in drug action.

The Committee on Scientific Research is headed by Dr. Ludvig Hektoen, of Chicago, who, according to his record in "American Men of Science," is one of the Nation's outstanding pathologists.

EDWARD MALLINCKRODT INSTITUTE OF RADIOLOGY

The cornerstone of the Edward Mallinckrodt Institute of Radiology of Washington University, St. Louis, was laid on October 2, 1930. The copper box placed within it contained a portrait of the late Edward Mallinckrodt, Sr., donor of $300,000 toward the erection of the institute.

BOOK REVIEWS

X-RAY CRYSTALLOGRAPHY. By R. W. JAMES, M.A., B.Sc., Senior Lecturer in Physics in the University of Manchester. With a general preface by O. W. RICHARDSON, F.R.S., Yarrow Research professor of the Royal Society, Nobel Laureate in Physics, 1928. Pages, 88; diagrams, 29. Published by E. P. Dutton & Co., Inc., New York, 1930. Price, $1.15.

This little treatise by the well-known Senior Lecturer in Physics at the University of Manchester is one of a series of monographs on physical subjects. In the preface by Professor O. W. Richardson the hope is expressed that the monographs may be of great service to physics students who have examinations to consider, to those who are engaged in research and other branches of physics and allied science, and to the large number of science masters and others interested in the development of physical science who are no longer in close contact with recent work. The subjects considered in the five chapters by Professor James are crystal form and the space groups, the crystal lattice as a diffraction grating, a symmetry of crystals and their determination by means of X-rays, the intensity of X-ray spectra, and types of crystal structure. Within the limited scope of so small a book obviously only the most general methods can be employed, but the presentation has been made with the greatest skill. It is difficult to imagine how scientific material could be more accurately described for the lay reader than has been done in this case. To the members of the medical profession who are interested in X-ray applications but are not familiar with the diffraction science and researches of the chemist and physicist, this is an excellent brief elementary but true introduction. It serves as a real appetizer in that the reader undoubtedly will want to seek the larger works covering the field after the hour spent in reading through the monograph.

G. L. CLARK, PH.D.

NORMAL ANATOMY OF THE HEAD AS SEEN IN THE ROENTGENOGRAM: PART I. By KARL GOLDHAMMER, M.D., Universitäts-Assistent, Leiter des Röntgenlaboratoriums an der I. Anatomischen Lehrkanzel (Prof. Tandler) in Wien. Photographic plates, 30; illustrative drawings, 30; projection diagrams, 15. Text in German, English, French, and Spanish. Published by Georg Thieme, Leipzig, 1930. Price, bound, 120 marks ($27.60).

The first part of this work contains thirty roentgenograms of the skull taken in fifteen different typical positions and for each view of a skeletal skull there is a corresponding one of the living. The pictures appear in the original size as photographic reproductions, in the negative. For each skeletal roentgenogram there is a small drawing in two projections to illustrate the point of focus.

Overlying each roentgenogram there is a red ink drawing on transparent cellophane which exactly fits the underlying picture. In this drawing every noteworthy line and every essential part of the skull is marked with a number. For example, the picture of the first transverse section in the living carries 107 numbers. In the adjoining text, written in four languages, one will find the names of the anatomical structures represented by each number.

Most of the pictures are excellent. This atlas, so splendidly prepared by the publisher, means a tremendous saving of work and effort to the beginner to whom the innumer-

able lines of the complicated human skull offer great difficulties. The expert will gladly consult it for advice.

We will eagerly await the second part of this work, containing twenty-two double illustrations, which will be available at the end of 1930.

F. Haenisch, M.D., (Hamburg, Germany)

Die Röntgenbehandlung der Nervenkrankheiten (The Roentgen Treatment of Diseases of the Nervous System). By Professor Dr. Otto Warburg and Doz. Dr. Max Sgalitzer, University of Vienna. Pages, 213, with 4 cuts in the text; paper. Supplement to "Strahlentherapie," No. 15, published by Urban & Schwartzenberg, Berlin and Vienna, 1930.

This book, which represents the combined efforts of a neurologist and a radiologist, is a summary and critical evaluation of the roentgen treatment of diseases of the nervous system.

In the "general part" (pages 3–50) are discussed the physical and biologic foundations of roentgen therapy and the authors' technic of treatment of various disorders of the nervous system.

In the "special part" (pages 53–213) are discussed (1) brain tumors; (2) pituitary tumors ; (3) meningitis serosa, hydrocephalus, lymphorrhea, headache; (4) epilepsy; (5) cord tumors; (6) compression syndromes; (7) syringomyelia; (8) inflammatory diseases of the nervous system; (9) diseases of the peripheral nerves; (10) angiodystrophic disorders; (11) dysglandular disorders, and (12) psychoses.

One marvels at such an efficient condensation of so many facts into so small a space, for which the authors deserve unlimited commendation. It seems unfortunate that so much valuable information should be available only to those who read German, and it is hoped that an English edition will soon be forthcoming.

Allgemeine Grundlagen: Physik und Technik des Röntgenverfahrens. Mit einem Vorwort von Univ.-Prof. Dr. Friedrich Dessauer. By M. Brenzinger, Dipl.-Ing., A. Janitzky, Dipl.-Ing., und Dr. E. Wilhelmy (Frankfurt a. M.). Pages, 237; illustrations, 275. XIV Band der Radiologische Praktika. Verlag Georg Thieme, Leipzig. 1930. Price M. 25,50 ($6.12).

This volume is intended to continue the tradition of the "Leitfaden des Röntgenverfahrens" by Dessauer and Wiesener, which was well known before the War. Three men especially experienced in their fields have written this book with the same viewpoints. The first part, about one hundred pages, pertaining to the physics of roentgenology, has been written by E. Wilhelmy. The laws of electricity and the physics of the roentgen rays are described in a clear and well arranged manner. M. Brenzinger gives a description of the different roentgen apparatus in the second part. The construction and structure of the induction apparatus, the transformer, and the constant potential apparatus are explained very instructively. After going into the danger from roentgen apparatus, an extensive description of modern machines follows. The third part, in which A. Janitzky deals with the roentgen and other vacuum tubes, will be especially welcome to physicians, as it seems that here a physicist has succeeded in talking intelligently to a physician and not expecting too much technical knowledge. The cathode tubes are explained from their first beginning in every respect. All types of tubes are described and the good old gas tube has not been forgotten.

A bibliography is appended to each chapter. The book has been very finely executed by the publisher, and the numerous illustrations are well made. It will surely find many readers.

F. HAENISCH, M.D., (Hamburg, Germany) *Translation by* H. W. HEFKE, M.D. *(Milwaukee, Wisc.)*

DISEASES OF THE URINARY TRACT IN CHILDREN. By EDWIN BEER, M.D., and ABRAHAM HYMAN, M.D. Pages, 328; illustrations, 50. Published by Paul B. Hoeber, Inc., New York, 1930. Price, $6.00.

The publication of this volume is quite timely and is indicative of the increasing interest in urologic conditions in children, in which Dr. Beer is one of the pioneer investigators. The development of the book is along the line of clinical investigation. The treatment for many of the conditions mentioned is purely surgical, but the authors do not attempt to include any discussion of surgical technic. Since the tenor of the volume is surgical, a more detailed discussion of medical treatment is probably not warranted. The subject matter is handled in an informal, conversational style and is adequately supplemented by brief case reports which bring out the individual differences possible in cases of the same type. At the time the book was sent to press the use of intravenous urography had not been sufficiently developed so that the report of any extensive series of cases could be included. However, since this procedure may not prove to be so widely adaptable as was expected, this may not prove to be a lack. The pyelograms, ureterograms, and cystograms are excellent and obviously were prepared by some one who understood the technic thoroughly. The bibliography is well chosen. The chief value of the book is its emphasis on the urologic approach in consideration of diseases of the urinary tract in children.

THE HEALTH-CARE OF THE BABY: A HANDBOOK AND FEEDING GUIDE FOR PHYSICIANS, MOTHERS, AND NURSES. By LOUIS FISCHER, M.D., Consulting Physician to the Willard Parker and Riverside Hospitals; Consulting Physician to the St. Vincent's Nursery and Babies' Hospital, Montclair, N. J.; Former Instructor in Diseases of Children at the New York Post-graduate Medical School and Hospital, and Former Attending Pediatrist to the Sydenham Hospital of New York and to the Infantorium and Heckscher Foundation and Nursery of New York City. Eighteenth ed., revised. Pages, 248. Published by Funk & Wagnalls Company, New York, 1929. Price, $1.00.

It is a distinct surprise to find that Funk & Wagnalls Company, champions of correct English, are the publishers of a volume in which errors in subject matter and of expression are so manifest. The chapter on X-ray, with its brief mention of diagnosis and therapy, and the one-page chapter on Transfusion might well have been omitted. This book certainly does not fill any want.

DISEASES OF THE SKIN: A TEXT-BOOK FOR PRACTITIONERS AND STUDENTS. By GEORGE CLINTON ANDREWS, A.B., M.D., Associate Professor of Dermatology, College of Physicians and Surgeons, Columbia University. Pages, 1091; illustrations 988. W. B. Saunders Co., Philadelphia and London, 1930. Price, $12.00.

Dermatology has been fairly well covered by three or four well-known American textbooks. The subject is, however, so broad in its various aspects that a new book can fill

a definite hiatus, provided that the author is in a position to fill the gap, partially at least. This, Dr. Andrews has done admirably by ignoring much antiquated and often misleading information, by emphasizing modern conceptions frequently evaluated critically by his personal experience, and by placing actinotherapy and other physical therapeutic measures in their proper place. For the latter he is particularly qualified by years of association with Dr. George Miller MacKee. The bibliography is up-to-date and very desirable for ready reference for the physician interested in the details of any given subject. One wonders, however, in passing, whether the author is familiar with the details of all of the quoted articles. The book is distinctly individualistic and will form an addition to any physician's library, no matter how well stocked it may be.

ABSTRACTS OF CURRENT LITERATURE

AUTHOR INDEX

ABBOTT, A. C. Anomalies of the Genito-urinary Tract 105

ACKMAN, F. D. Multiple Adenopapillomata of the Stomach, with Report of Case Showing Varying Degrees of Malignancy 103

AGATI, DINO. Bilateral Vesalanium Bone of the Foot 82

ALBRECHT, HANS. Temporary Amenorrhea in the Treatment of Endometrial Tumors of Ovarium and Peritoneum 109

ANZILLOTTI, ALBERTO. The Radiological Diagnosis of Duodenal Ulcer 98

Idem. Diagnosis of the Nature of Benign Growths of the Stomach 100

ARCHER, VINCENT W. Hypertrophic Pyloric Stenosis in Adults: Roentgen Aspects 99

AWALISCHWILI, G. GR. A Case of Osteopoikilia 83

BALESTRA, GIOVANNI, and GHIO, ADOLFO. The Radiologic Aspect of the Lungs and Valvular Defects of the Heart 92

BOICE, EDMUND S. Cancer of the Breast 90

BOYD, WILLIAM. Notes on the Pathology of Primary Carcinoma of the Lung 87

BRAASCH, WILLIAM F. Intravenous Urography (Editorial) 108

BROOKE, CHARLES R. Physical Therapy and Radiotherapy during 1929 29

CALLAHAN, JAMES J. (*with* CUBBINS, WILLIAM R., and CONLEY, ARTHUR H.) 82

CHIZZOLA, GIULIANO. A New Technic for the Radiological Study of the Stenotic Affections of the Esophagus 96

Idem. Importance of Radiological Control on Duodenal Drainage 98

COFFEY, ROBERT C. Radical Treatment of Cancer of the Bladder 89

COLBY, FLETCHER H. Intravenous Urography 104

CONLEY, ARTHUR H. (*with* CUBBINS, WILLIAM R., and CALLAHAN, JAMES J.) 82

CRANE, JAY J. Diverticula of the Urinary Bladder in Women: Report of Cases 105

CUBBINS, WILLIAM R., CONLEY, ARTHUR H., and CALLAHAN, JAMES J. Fractures of the Acetabulum 82

DALL'ACQUA, VIRGILIO. The Radiological Aspects of Duodenal Mobility 99

EHRMANN, R. Diagnosis and Therapy of Acute Necrosis of the Pancreas 99

ENFIELD, CHARLES D. Evaluation of the X-ray Examination in Duodenal Ulcer 101

FARRELL, JOHN T., JR. The Roentgen Appearance of the Chest of the New-born Infant 94

FRIEDENWALD, JULIUS. The Human Constitution in its Relation to Gastro-intestinal Disorders 98

FREUND, ERNST. Concerning the Unusual Changes in the Epiphyses of the Femora Described by Kreuz 84

GAESSLER, E. O. Systemic Changes in Patients with Carcinoma of the Uterus Following Roentgen and Radium Treatment 89

GAUSS, C. J. The Clinic of Temporary Roentgen Amenorrhea 110

GAVAZZENI, ANTONIO. Radiological Aid in the Study of Chronic Colitis 100

GHIO, ADOLFO (*with* BALESTRA, GIOVANNI) 92

GILBRIDE, JOHN J. Duodenal Fistula 102

GIUNTOLI, LORENZO. Segmentary Toxic Gastritis of the Antrum Pylori 97

GRAY, A. L. Some of the Deforming Bone Diseases of Adolescence 84

GRAY, IRVING, and MATZNER, MILTON J. Biliary Colic in Routine Cholecystography 97

GRICOUROFF, GEORGES. Histological Study on the Effects of X-rays on the Ovary during the Period of Oögenesis 109

HEACOCK, C. H. Diverticula of the Thoracic Portion of the Esophagus 96

HEAD, JEROME R. The Technic of the Intratracheal Injection of Iodized Oil 95

HERR, A. (*with* KANTER) 58

HUTTER, KARL, and SGALITZER, MAX. Concerning the Roentgenologic Demonstration of the Kidneys and Urinary Passages by Intravenous Injection of Uroselectan 106

HYMAN, ABRAHAM. Intravenous Urography in the Diagnosis of Urological Diseases of Childhood 105

JACKSON, CHEVALIER. The Mechanism of Physical Signs in Neoplastic and Other Diseases of the Lung, with Especial Reference to Atelectasis and Emphysema 93

KANTNER and HERR, A. Roentgen Examination in Technical Fields 58

KANTOR, JOHN L., SCHECHTER, SAMUEL, and MARKS, JEROME A. Colon Studies: VI.—Cecal Stasis: Its Clinical Significance and Relation to Proximal Colon Stasis 101

KIENBÖCK, ROBERT, and MARKOVITS, EMMERICH. A Case of Osteitis Fibrosa Cystica Generalisata 83

KRETSCHMER, HERMAN L. Intravenous Urography 106

LACASSAGNE, A. The Results of Radiotherapy in Adenocarcinoma of the Uterus 88

Idem. Radiotherapy of Carcinoma of the Uterine Cervix at the Radium Institute of Paris 88

LACHARITÉ, H. Giant-cell Tumors of Bone—A Clinical, Histological, and Radiotherapeutic Study 84

LAROCHE, ALBERT. Intravenous Pyelography 108

LEWALD, L. T. Giant-cell Bone Tumors: Four Cases Successfully Treated by Roentgen Rays 84

LINDSAY, H. C. Diseases of the Tongue 90

LUCAS, ERNST, and POLLACK, HERBERT. A Contribution to the Diagnosis of Carcinomatous Pulmonary Lymphangitis 87

LYNCH, KENNETH M., and SMITH, W. ATMAR. Asbestosis Bodies in Sputum and Lung 94

MCLESTER, JAMES S. Clinical Syndromes that Include Achlorhydria 100

MARKOVITS, EMMERICH (*with* KIENBÖCK, ROBERT) 83

MARKS, JEROME A. (*with* KANTOR, JOHN L., and SCHECHTER, SAMUEL) 101

MATZNER, MILTON J. (*with* GRAY, IRVING) 97

MELAND, ORVILLE N. (*with* SOILAND, ALBERT) 91

MONOD, OCTAVE (*with* VINZENT, RENÉ) 89

MOORE, ALEXANDER B. An Appraisal of the Motor-test-meal in the Roentgen Examination of the Stomach and Small Bowel 97

MORRISON, L. B. The Rôle of X-ray in the Diagnosis of Carcinoma of the Colon 86

MOSENTHAL. Congenital Exostoses and Their Transformation into Osteochondromas 85

MURPHY, GEORGE T. The Effect of Acute Experimental Cholecystitis on the Emptying of the Gall Bladder 97

MUZII, MARIO. Epibronchial Diverticulum of the Esophagus in a Patient Affected by Gastric Neoplasm 96

OERTEL, HORST. On the Mechanism of Cancer Development 86

OKA, MITSUTOMO. Clinical Use of "Lienography," a New Method for the Roentgenologic Demonstration of the Spleen and Liver 95

OTTONELLO, PIETRO. Potassium in Radiobiology .. 29

Idem. The Alimentary Tract in Flajani-Basedow's Disease 101

PALUGYAY, JOSEF. Intravenous Demonstration of the Morphologically and Functionally Normal Urinary Apparatus 107

PANSDORF, H. The Roentgen Diagnosis of Inflammatory Lesions of the Colon and Their Differentiation from Carcinomas 100

PARDOLL, DAVIS H. (*with* WELFELD, JOSEPH) 104

PATCH, FRANK S. Birth Traumatism as a Factor in Urinary Infection 107

POLLACK, HERBERT (*with* LUCAS, ERNST) 87

POTENZA, VITO. Stenosis of the Submesocolic Portion of the Duodenum 98

POTTE, N. W. The Roentgenologic Appearance of Lobular Pneumonia (Bronchopneumonia) 94

RATKÓCZI, NÁNDOR. Concerning my Method for the Screen Examination of the Duodenum .. 102

READ, J. STURDIVANT, and SENGER, FEDOR L. Intravenous Urography 107

REGAUD, CL. Organization and Efficiency in the Fight against Cancer of the Uterus 85

REGELSBERGER, H. The Roentgenologic Demonstration of the Mucosa by Means of Umbrathor: A Contribution to the Roentgenologic Diagnosis of Ulcerative Colitis 95

RUBASCHEVA, ANASTASIA. The Blood Supply of the Gall Bladder 97

SALOTTI, ADELCHI. Radiological Signs of Early Cancer of the Stomach 86

SANDERA, ROBERT. The Roentgenologic Appearance of Diverticula of the Duodenum and of Structures Resembling Such Diverticuloids .. 102

SCHECHTER, SAMUEL (*with* KANTOR, JOHN L., and MARKS, JEROME A.) 101

SENGER, FEDOR L. (*with* READ, J. STURDIVANT) 107

SGALITZER, MAX (*with* HUTTER, KARL) 106

SIGHINOLFI, GIUSEPPE. A Case of Ileocolic Mesenterium Commune, without Rotation 103

SMITH, W. ATMAR (*with* LYNCH, KENNETH M.) 94

SOILAND, ALBERT, and MELAND, ORVILLE N. Intra-oral Cancer and its Treatment 91

SOPER, HORACE W., and THOMPSON, J. WILLIAM. Roentgen Evidence of Adhesions of the Small Intestine 102

STEIN, JACOB. Congenital Pneumothorax: Review of the Literature and Report of a Case 92

TARTAGLI, DINO. Examination of the Urinary Ducts, with a New Substance Intravenously Injected 104

THOMPSON, J. WILLIAM (*with* SOPER, HORACE W.) 102

TURANO, LUIGI. The Pyelographic Image after the Injection of Uroselectan 104

VELDE, GUSTAV. The Lobus Venæ Azygos: Its Visibility on Roentgenologic Examination and its Significance for the Clinician 93

VIAMONTE, MANUEL. Fibrinous Pneumonia, with Partial Lobar Consolidation 92

VINZENT, RENÉ, and MONOD, OCTAVE. A Study of the Microbial Flora of Carcinoma of the Cervix and Their Importance in Radiotherapy 89

VISCHIA, QUINTINO. Posterior Mediastinal Empyema Perforating into a Bronchus 95

WELFELD, JOSEPH, and PARDOLL, DAVIS H. Uroselectan in Intravenous Urography 104

WILSON, JOHN C. Fracture of the Neck of the Femur: End-results in Eighty-six Cases 83

SUBJECT INDEX

Bone (Diagnosis) 82

Bone Diseases (Diagnosis) 83

Bone Tumors (Therapy) 84

Cancer (Diagnosis) 85

Cancer (Therapy) 88

The Chest (Diagnosis) 92

Contrast Media 95

Esophagus (Diagnosis) 96

Gall Bladder (Normal and Pathological) 97

Gastro-intestinal Tract (Diagnosis) 97

Genito-urinary Tract (Diagnosis) 104

Gynecology and Obstetrics 109

BONE (DIAGNOSIS)

Bilateral Vesalanium Bone of the Foot. Dino Agati. La Radiologia Medica, June, 1930, XVII, 683.

The author has observed a vesalanium in the foot of a young athlete. The anomaly is bilateral. The abnormal bone is of a shape different from those previously reported, and of larger dimensions.

The author reviews the theories which have been advanced on the pathogenesis of these superfluous bones, and compares the characteristics of the case in question with those reported by other authors. He admits the epiphyseal origin of the bone, but thinks that we should not discard the hypothesis that functional factors (such as athletic activities) may be the cause of abnormal development. He concludes by summarizing the roentgenologic signs to be considered in differentiating the vesalanium from the sesamoid bone of the fibula, and the fracture of the tuberosity of the "V" bone of the metatarsus.

L. MARINELLI.

Fractures of the Acetabulum. William R. Cubbins, Arthur H. Conley, and James J. Callahan. Surg., Gynec. and Obst., September, 1930, LI, 387.

The authors state they were not satisfied with the classifications as presented in the various texts and articles and give the following classification of fractures of the acetabulum:

A. Fractures of the rim.—(1) An oblong fragment on the posterior lip of the acetabulum, essentially that portion contributed by the ischium in its development. (2) An oblong fragment, essentially that portion contributed by the ilium. (3) An oblong fragment, essentially that portion contributed by the pubic bone.

B. Fractures of the acetabulum involving one or two of the three bones of which it is formed.—(1) Fracture with displacement inward and backward of the ischial segment and ramus. (2) Fracture with displacement inward of the pubic segment and ramus. (3) Fracture displacing both the pubic and ischial segments with rami. (4) Fracture with displacement inward and backward of the ilial segment.

C. Perforating fractures.—In this type the head is forced through the bottom of the acetabulum with a very small amount of the surrounding bone.

D. A fracture so extensive that all of the bones are involved and fragmented.

Under etiology, experimental work done in the anatomical laboratory of Northwestern University Medical School by Charles M. Fox, working with and under the direction of Dr. William E. Schroeder, was published in the *Quarterly Bulletin of Northwestern University Medical School* in April, 1909, and the authors quote from the article as follows:

> "We took fourteen cadavers and used only a five-pound hammer, striking the trochanter with the leg extended and slightly adducted. Of the femurs so treated, four promptly fractured the acetabulum in various directions. A fragment of the ilium, one from the ischium, and one from the pubis constitute the so-called inverted Y-shaped fracture and allowed the head of the femur to protrude. The other results were not so typical, the lines of fracture running into the obturator foramen, into the ischiatic notch, and through the rami. Of the remaining six experiments there was one impacted fracture of the neck of the femur and two fractured trochanters and three fractured necks. In four cadavers the blow was applied to the knee, resulting in four fractures of the neck of the femur; it seems to me the greatest importance is to be attached to the position of the head and neck of the femur and the blow. If the force is suddenly applied, the elasticity of the pelvis will be of little or no consequence and the head will be forced through the acetabulum, whereas a slow force will be associated with vertical, ring, and other fractures of the pelvis."

The symptoms of fractures of the rim and the more extensive fractures of the acetabulum are taken up separately. In rim fractures, pain on motion and loss of function are always present. Tenderness around the outer surface of the joint can be elicited in thin or moderately large individuals.

If the ischial portion of the rim is fractured and the patient is in a recumbent position, the limbs will be of the same length. Flexion of the limb and medial rotation of the femur will give a peculiar click and jump. The femur then tends to remain flexed and adducted, but can be easily restored to the original position. If this condition goes undiagnosed

and untreated, serious disability will result, due to repeated subluxations, which are painful. Later a chronic, traumatic arthritis will develop, with more or less destruction of the joint tissues.

If the ilial segment of the rim is fractured, a slight adduction is sometimes necessary to make it click. In fractures of the acetabulum which are perforating or fragmented, the length of the limb varies. Any motion, active or passive, is painful, but flexion is usually possible. Abduction is seldom possible. Marked tenderness over the lower abdomen is nearly always present, while rigidity is common. Blood in the urine is not an uncommon finding. By rectal or vaginal palpation marked tenderness can be elicited and, commonly, a mass will be found where the fracture is located, whether there has been a dislocation inward of the fragments or only a hemorrhage from the fractured bone.

The prognosis and treatment of these cases are discussed.

D. S. CHILDS, M.D.

Fracture of the Neck of the Femur: End-results in Eighty-six Cases. John C. Wilson. California and Western Med., October, 1930, XXXIII, 707.

The author discusses the results of eighty-six cases of fracture of the neck of the femur. In discussing the classification of these fractures, he says, "In describing hip-joint fractures, the terms 'intracapsular,' 'extracapsular,' 'medial,' and 'lateral' are frequently used in medical literature, but these terms only add to the disorder because extracapsular or lateral fractures are not fractures of the femoral neck. The neck of the femur is an entity, and much confusion will be avoided if fractures are described according to their true anatomic confines. Fractures of the neck of the femur and those of the intertrochanteric region are not comparable. Intertrochanteric fractures should cause no concern, while the same cannot be said of fractures of the neck of the femur.

"The term 'impacted fracture' is ambiguous. It should be used only when its meaning is clearly understood. Locking of the fragments may be sufficiently secure to permit weight-bearing, but is in no sense an impaction. A careful study of stereoscopic roentgenograms will demonstrate a complete absence of contact between the fractured surfaces; on the other hand, the X-ray may show a break in continuity of the neck, with a little shortening of the leg and a mild coxa vara."

Under "Treatment," he states, "Stereoscopic X-ray control is essential to check the accuracy of the reduction."

In discussing the causes of failure, he says, "Failure may be attributed to imperfect reduction, insufficient fixation, interposition of soft tissue, or lack of blood supply about the point of fracture. The surgeon has no control over the blood supply, but he can obtain and maintain a reduction. He also has a reasonable opportunity to prevent the interposition of soft tissues."

F. B. SHELDON, M.D.

BONE DISEASES (DIAGNOSIS)

A Case of Osteopoikilia. G. Gr. Awalischwili. Röntgenpraxis, Sept. 15, 1930, II, 831.

Osteopoikilia or osteitis condesans generalsata is one of the rarest diseases of the skeleton. A case is described, showing a typical picture of generalized, small, sclerotic areas in the entire skeleton, but especially in the pelvic bones and the lower extremities. Clinical symptoms were not present.

H. W. HEFKE, M.D.

A Case of Osteitis Fibrosa Cystica Generalisata. Robert Kienböck and Emmerich Markovits. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 904.

Detailed history and extensive critical discussion of a case of Engel-Recklinghausen's disease (Engel, 1864, Recklinghausen, 1891), which showed several peculiarities, as follows: development during childhood; repeated progressive exacerbations; marked osteomalacic deformities; formation of large but not excessive expansive cysts and cyst-like areas; multiple spontaneous fractures; pronounced

pagetoid cranial changes; mild affection of the hands; progressive tendency towards aggravation. The duration at the time of report was fourteen years. A tumor of the parathyroid could not be detected by palpation, but its presence must nevertheless be assumed.

HANS A. JARRE, M.D.

Concerning the Unusual Changes in the Epiphyses of the Femora Described by Kreuz. Ernst Freund. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 935.

An unusual pathologic picture of hip pathology in a boy 15 years of age is reported. In both epiphyses of the femoral heads the upper shell was markedly changed, porotic, defective, and demarcated towards healthy portions of the bone by a rather wide band of sclerotic appearing bone. This, off-hand, could not be reconciled with the common diagnosis of a Perthes' disease, though all clinical symptoms were identical.

In the discussion of this case and the identical one reported by Kreuz, the opinion is substantiated that an aseptic necrosis occurred differing from the typical Perthes' disease only in extent, localization, and the mechanism of healing (reorganization). It is also mentioned that as a result of fractures through the femoral neck one may observe similar, wedge-shaped aseptic necroses, radiographically apparent as subchondral foci of destruction, with surrounding osteosclerosis.

HANS A. JARRE, M.D.

Some of the Deforming Bone Diseases of Adolescence. A. L. Gray. Am. Jour. Roentgenol. and Rad. Ther., May, 1930, XXIII, 485.

The author discusses a group of allied bone diseases occurring in the latter half of the first decade and first portion of the second decade of life. Consideration is given to vertebral epiphysitis (Scheuermann's disease), separation of the epiphyseal head of the femur, osteochondritis deformans juvenilis coxæ (Legg-Perthes' disease), apophysitis of the anterior tibial tubercle (Osgood-Schlatter's disease), and osteochondritis of the tarsal scaphoid (Köhler's disease). The author also describes a hip condition occurring in the same age period as Legg-Perthes' disease in which a broadening and softening of the acetabulum can be demonstrated, at times without changes in the femoral head, which he designates as acetabular Legg-Perthes' disease.

The combined factors of infections plus traumatism, resulting in localized deficiency of blood supply, are believed to be the etiologic factors.

J. E. HABBE, M.D.

BONE TUMORS (THERAPY)

Giant-cell Bone Tumors: Four Cases Successfully Treated by Roentgen Rays. L. T. LeWald. Medical Times, August, 1930, LVIII, 232.

This condition is sometimes spoken of as osteitis fibrosa cystica, or bone cyst. The X-ray alone can be used with success in these cases. If surgery is employed, a simple curettement should be followed by X-ray therapy.

Four case reports are given with roentgenograms, in all of which cure was brought about by X-ray treatment alone. One case was curetted after a pathologic fracture, this being followed by X-ray treatment. The author considers this method preferable to surgery in giant-cell bone tumors.

W. W. WATKINS, M.D.

Giant-cell Tumors of Bone—A Clinical, Histological, and Radiotherapeutic Study. H. Lacharité. Radiophysiologie et Radiotherapie, 1930, Vol. I, Fasc. IV, 535.

These tumors occur principally between the ages of 10 and 25 years. They attack chiefly the jaws and the epiphyses of the long bones. They are of slow development and do not give rise to metastasis or glandular involvement. They are, however, locally malignant and tend to recur after local removal. Macroscopically, they are dark colored, solid, and cystic growths, originating either from the perios-

teum or spongy tissue, while, microscopically, they are characterized by the presence of large numbers of multinucleated giant cells, regularly distributed throughout the growth. The importance of the biopsy in all cases is emphasized, and the author is of the opinion that any disadvantages of this procedure are outweighed by the advantages.

The results of radiation treatment in fourteen cases are recorded. Of these, eight were growths of the upper jaw, four of the lower jaw, one of the upper end of the humerus, and one of the cervical spine. Seven of these cases were post-operative recurrences. The technic of treatment varied greatly from case to case. Five cases were treated with radium, of which three were by interstitial methods, one by surface radium therapy, with moulded apparatus, and one by resection, followed by the insertion of a radium tube into the cavity. The filtration varied from 0.4 to 1.0 mm. of platinum, and the doses administered varied from 5.58 to 18.86 millicuries destroyed, given in one or more applications of from four to ten days each.

In nine cases, the X-ray was used. In these cases the voltage varied from 125 to 200 kilovolts, and the filtration from 5 mm. of Al to 2 mm. of Zn. The dose varied from 50 to 80 Holzknecht units over a period of from fifteen to forty-five days. In general, the doses were smaller than those employed in the treatment of carcinoma. Regression occurred as a result of the treatment in every case, but it was observed that a temporary increase in swelling and symptoms often preceded the regression. The temptation is to regard the treatment as having failed, and to operate during this stage. All the cases referred to in this paper are regarded as cured. The period since treatment is eight years in one case, seven years in four cases, six years in two cases, five years in one case, three years in three cases, and under three years in three cases. Post-operative recurrences give good results, but the response is slower than in primary cases. Incomplete operation followed by irradiation is condemned.

WALTER M. LEVITT, M.B., D.M.R.E.

Congenital Exostoses and Their Transformation into Osteochondromas. Mosenthal. Röntgenpraxis, August 15, 1930, II, 748.

Two patients (father and son) have been observed by the author, both showing multiple exostoses. In one case he could observe the origin and development of the exostoses into an osteochondroma, and in the other case he could see a very large tumor as the end-result of such development. Therapeutically, only roentgen therapy offers anything. In two other cases of large chondroma of the pelvis, roentgen therapy led to liquefaction of the tumors and finally to a transformation of the chondromas into solid bone.

H. W. HEFKE, M.D.

CANCER (DIAGNOSIS)

Organization and Efficiency in the Fight against Cancer of the Uterus. Cl. Regaud. Radiophysiologie et Radiotherapie, 1930, Vol. II, Fasc. I, 81.

This paper is a reprint of Professor Regaud's report on this subject to the Cancer Sub-committee of the Section of Hygiene of the League of Nations.

The subject is discussed from three main standpoints: (1) Early diagnosis; (2) correct treatment, and (3) organization. As regards early diagnosis, emphasis is laid upon public instruction, increased facilities for special instruction of doctors and midwives, and above all, upon the importance of regular periodical examination. Every effort should be made to accustom the public to the idea of regular examination, and special gynecological diagnostic centers should be provided in every district. There is as yet no general agreement on the question of correct treatment, and only by very thorough organization of work, resulting in the production of irreproachable statistics, can such agreement eventually be achieved. As regards organization, while the necessity for early diagnosis demands widespread local facilities, the requirements for treatment are best met by the provision of a

small number of highly specialized institutions possessing adequate radium supplies, powerful X-ray therapy apparatus, and highly competent staffs. The hiring of radium and the sale of radon to isolated practitioners lead to unsatisfactory results, and are to be discouraged.

WALTER M. LEVITT, M.B., D.M.R.E.

Radiological Signs of Early Cancer of the Stomach. Adelchi Salotti. Minerva Medica, May 19, 1930, XXI, 809.

A closer co-operation between the surgeon and the radiologist is advocated for a more exact radiologic technic in the diagnosis of cancer of the stomach in its early stages. The various morphological modifications which cancer may produce, namely, the infiltrating anomalies of the tissue, the vegetating protuberances of the gastric walls, and the ulcus cancer, result in radiographic images of different types. A series of radiographs is advised in each case, and different technics should be followed (Vallebona, Baastrup, Forssell), as the case might suggest.

The author includes a great number of radiographic illustrations, and discusses, in detail, the characteristics pertaining to neoplastic lesions as compared to those of non-malignant nature.

L. MARINELLI.

On the Mechanism of Cancer Development. Horst Oertel. Canadian Med. Assn. Jour., August, 1930, XXIII, 183.

The author, who is Strathcona Professor of Pathology at McGill University, Montreal, sums up in this paper "the present state of our knowledge of cancer, as viewed from the standpoint and in the light of sober facts, purely as a scientific problem." He deals with the problem of the mechanism by which the cancerous or tumor change in tissues is initiated and executed.

He reaches these conclusions:

(1) The cancer cell is the expression of an atypical cell regeneration which results from continued disturbances in the normal relations between tissue cells, their vascular supply, and innervation. This brings about modifications in the normal course of cell differentiation, its metabolic and formative functions, thus exhibiting shiftings from the normal, typical cell, and cell growth.

(2) It develops and grows on the basis of a general and organ disposition (metabolic peculiarities) in (*a*) the tissues of the host connected with the vascular supply, stroma, nerves, and in (*b*) the cancer cells themselves.

(3) The cancer cells, thus produced, are not open to those physiological environmental tissue influences which normally determine relative position and differentiation in new cells. Hence they grow as a new entity, with their own blood and nerve supply which are adapted only to their growth. The physiological, stationary, fully differentiated tissue is thus replaced wherever the atypical cancer cells grow, not by any particular aggression of the tumor cells, but by supersession of a new, actively growing tissue organization which is grafted on an old stationary one.

He concludes: "The tumor problem, like any other scientific problem, cannot be solved by shots in the dark, by spectacular discoveries, by fantastic ideas, or by a desire to find a cure by 'killing the cancer cells,' but by the sober, necessarily slow, intensive penetration into the laws which govern growth, because the tumor problem is a problem of growth. . . . When we know exactly the terms and mechanical steps of growth the 'tumor problem' will be within reach of our understanding."

L. J. CARTER, M.D.

The Rôle of X-ray in the Diagnosis of Carcinoma of the Colon. L. B. Morrison. New England Jour. Med., Sept. 4, 1930, CCIII, 441.

There are two methods of X-ray examination of the colon; the barium meal by mouth gives a study of the movement of food through the colon; the barium enema shows the complete filling of the colon, with its internal outline when distended, and is by far the most satisfactory method. In either case the X-ray is simply a shadow study which depicts the outline of the colonic cavity, its

varying peristaltic movements and positions. The patient should be properly prepared for a barium enema by oil and a cleansing enema. A large rectal tube with three openings is preferred; this is inserted just past the internal sphincter, the barium mixture is made thin and the container is kept about twenty inches above the patient. The filling of the colon should be watched under the fluoroscope. The common types of carcinoma found in the colon are the medullary, colloid, and scirrhous or a combination of these. They occur most frequently in the male between the ages of fifty and sixty. The medullary and colloid types are ulcerating and found more frequently in the proximal colon. The scirrhous type is slow-growing and tends to obstruct, and is found most frequently in the flexures, the descending colon, and the sigmoid. The enema shows a filling defect in the ulcerative types, or meets obstruction at the site of the lesion in the obstructive type. Carcinoma must be differentiated from colitis, simple or ulcerative, diverticulitis, chronic constipation. A great majority of patients come for X-ray examination after a partial obstruction has taken place and in this condition a significant observation is that the bowel proximal to the lesion is filled with large masses of fecal material and somewhat distended with gas, while distal to the lesion, the bowel is usually empty. Often there are recurrent attacks of diarrhea in which the amount of the movement is very unsatisfactory.

W. W. WATKINS, M.D.

Notes on the Pathology of Primary Carcinoma of the Lung. William Boyd. Canadian Med. Assn. Jour., August, 1930, XXIII, 210.

The author, who is Professor of Pathology in the University of Manitoba, Winnipeg, analyzed 14 cases of primary carcinoma of the lung met with in 900 autopsies in the Winnipeg General Hospital, together with 9 additional cases.

A study of the combined material has brought to light a number of unexpected facts, some of which are at variance with the generally accepted teaching.

While the sex incidence is usually given as 3 males to 1 female, there was not a female in the 14 autopsied cases.

The conclusions arrived at by the author are as follows: (1) Part of the reported increase in primary carcinoma of the lung is to be attributed to the fact that many cases formerly diagnosed as sarcoma and lymphosarcoma are now regarded as carcinoma; (2) The sex incidence of the disease is very marked; (3) There is little evidence in support of the view that the inhalation of the exhaust gases from automobiles, or the tar from tarred roads, is a factor of any etiological importance; (4) One of the most common and important forms of lung cancer is the undifferentiated or anaplastic type, which was formerly regarded as a sarcoma; (5) All forms display a great tendency to invade the blood vessels and thus spread to distant organs; (6) Of these organs, the liver, brain, kidney, and adrenals are among the most frequently attacked; (7) Silver staining is of value in demonstrating the essential carcinomatous character of even the most anaplastic forms.

L. J. CARTER, M.D.

A Contribution to the Diagnosis of Carcinomatous Pulmonary Lymphangitis. Ernst Lucas and Herbert Pollack. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 865.

Carcinomatous pulmonary lymphangitis is not as rare as is generally assumed. It is represented by a peculiar accentuation of pulmonary markings resembling a diffuse, rather sharply contoured honey-combing, which may include pinhead-sized spots in its meshwork. As one cannot differentiate in any normal chest picture between the vascular markings cast by arteries, veins, and lymphatic vessels, all of which combined produce most of the linear pulmonary markings, one must consider for differential diagnosis all types of pathology liable to produce exaggeration of these markings: cardiac insufficiency, with stasis and congestion in the pulmonary circulation;

congenital dilatation of the pulmonary artery and its branches; hyperemia during infections and associated with polycythemia; furthermore, chronic bronchitis, pneumoconiosis, chronic tuberculous induration. A good history will help considerably with a differential diagnosis. However, in all cardiovascular cases one will be able to detect signs of congestion and edema, while infections, especially pneumoconiosis with chronic bronchitis, and tuberculosis, will be unevenly distributed and show initial foci. Most patients are referred with a diagnosis of tuberculosis or chronic bronchitis. While the majority cite complaints referable to the latter, some patients may not have any pulmonary symptoms at all.

Four cases are reported: (1) One arising from a carcinoma of the prostate, with bone metastases; (2) one from a penny-sized scirrhus of the stomach, duration apparently five years, complicated by syphilis; (3) the third spreading from a bronchial carcinoma, primary focus detected only at autopsy—apparently bronchoscopy is not a standard procedure in this hospital; (4) the fourth, without autoptic proof, associated with a large carcinoma of the stomach.

HANS A. JARRE, M.D.

CANCER (THERAPY)

The Results of Radiotherapy in Adenocarcinoma of the Uterus. A. Lacassagne. Radiophysiologie et Radiotherapie, 1930, Vol. II, Fasc. I, 133.

The diagnosis of carcinoma of the body of the uterus is difficult clinically, and even when fragments removed by curettement are submitted to the microscope, a positive diagnosis is often not made. The author records the results of radiation treatment in thirty cases of carcinoma of the body of the uterus, in which the microscopical characters of the growths corresponded with the classical description of adenocarcinoma. Of these cases, eighteen were treated by intracavitary radium, four by X-rays, two by X-rays in combination with radium, and six by intracavitary, combined with transcutaneous, radium. Details of the technic are not given. Of the thirty patients treated, three died of infective complications during or shortly after treatment; seven were improved, and five became free from signs of the disease and remained well. The interval since the treatment in the five well cases is eight years in one, and from two to three years in the others.

The author concludes that, in view of the fact that the results are much inferior to those obtained in carcinoma of the cervix, in the present state of knowledge operation is to be preferred to irradiation in the treatment of carcinoma of the body of the uterus.

WALTER M. LEVITT, M.B., D.M.R.E.

Radiotherapy of Carcinoma of the Uterine Cervix at the Radium Institute of Paris. A. Lacassagne. Radiophysiologie et Radiotherapie, 1930, Vol. II, Fasc. I, 95.

An investigation has been in progress since 1919, at the Radium Institute of Paris, on the radiation treatment of carcinoma of the cervix. Until 1920, emanation was exclusively used, in powerful foci and with relatively light filtration. The duration of treatment was short, usually one to three days, and the total dose comparatively small, rarely greater than 2,600 mg.-hours. In certain hypertrophic growths, needles or seeds were inserted into the growth. Radium puncture, whether by needles or seeds, was given up in 1922. High powered, deep therapy apparatus was installed in 1921, increased to eight in 1927. The technic of the local radium treatment was standardized in 1923, and has since remained unchanged. Six tubes are used, each of 15 mm. active length. Of these, four contain 13.33 mg. each of radium element, and two contain 6.66 mg. each. The filtration is never less than 1 mm. of platinum. Three tubes, enveloped in rubber, are placed end-to-end in the uterine canal (two of 13.33 mg. and one of 6.66 mg.). Two tubes, each of 13.33 mg., are placed in the fornices and held apart by a spring. The sixth tube, of 6.66 mg., is placed centrally at the upper end of the vagina. The

average duration of the treatment is five days, continuously. Sepsis is treated before the insertion of the radium. In the case of localized growths, no further treatment is given, but in more advanced growths, great importance is attached to the combination of the radium treatment with deep X-ray therapy. Adenocarcinoma and recurrences after the above treatment are dealt with surgically.

In all, 350 cases have been treated, of which 38 were in Stage I, 132 in Stage II, 149 in Stage III, and 31 in Stage IV. The percentage of five-year cures is given as 42 per cent for Stage I, 28 per cent for Stage II, 10 per cent for Stage III, and 0 per cent for Stage IV. The total five-year-cure rate is 20 per cent. Since 1924, a certain number of cases have been treated by telecurietherapy, with a four-gram bomb, in addition to the radium locally. This method of treatment and deep X-ray therapy are considered as alternative methods.

WALTER M. LEVITT, M.B., D.M.R.E.

Systemic Changes in Patients with Carcinoma of the Uterus Following Roentgen and Radium Treatment. E. O. Gaessler. Strahlentherapie, 1930, XXXVII, 361.

The author undertook extensive studies of the blood constituents in fifteen cases of uterine carcinoma before and after radium and X-ray treatment. It appeared that the irradiation produced an increase in the alkali reserve, an increase in the plasma volume, and of the total plasma protein. The changes in the fibrinogen, albumin, and globulin varied. The calcium in the blood is usually considerably increased following X-ray treatment. Fairly regular is the decrease of the cholesterol, of the surface tension, and of the fatty constituents of the blood. All these changes are only transitory. Radium treatment increases the plasma volume, sometimes the fibrinogen and globulin, but otherwise does not show any definite influence. The conclusion is reached that in carcinoma patients subjected to irradiation, an accurate study of all metabolic processes is essential, at least the alkali reserve, the blood protein, the fats, cholesterol, potassium, and calcium should be studied. If, after an apparently clinical cure, these tests still show a deviation from the normal, the case should not be considered as cured but should receive further treatment.

ERNST A. POHLE, M.D., PH.D.

A Study of the Microbial Flora of Carcinoma of the Cervix and Their Importance in Radiotherapy. René Vinzent and Octave Monod. Radiophysiologie et Radiotherapie, 1930, Vol. II, Fasc. I, 143.

The infecting organisms in carcinoma of the cervix are not constant, but the commonest is a hemolytic streptococcus. These infections are difficult ones with which to deal. Vaccine therapy, local and general, and serum therapy have all been tried, with only an occasional success in each case. Bacteriological examinations should, however, be carried out in all cases in which radiation treatment is contemplated, and in the presence of a hemolytic streptococcus one should proceed only with great caution.

WALTER M. LEVITT, M.B., D.M.R.E.

Radical Treatment of Cancer of the Bladder. Robert C. Coffey. California and Western Med., August, 1930, XXXIII, 562.

The author gives his method of transplanting the ureters into the rectum. In the case of malignancy in the bladder—and then because the bladder becomes useless—it may be destroyed either by extensive surgery or by radium. Radium has an advantage in that it carries no mortality, and is especially useful in treating the region of the trigone.

Subtotal cystectomy in the male, for carcinoma located in the movable contractile portion of the bladder, should be ideal. In this way, the remaining base of the bladder and the urethra could be treated, and even destroyed with radium at the option of the operator, depending upon the case. Complete cystectomy in the female is by no means so difficult, and has been performed by the author in one case

following bilateral transplantation of the ureters, with perfect results. However, for cancer of the base of the bladder in women, even in operable cases, it may be possible that surgery may give no better results than destructive doses of radium, for in the female the base of the bladder may be treated through the anterior wall of the vagina, as well as from the inside of the bladder. For cancer of the movable part of the bladder in the female, subtotal cystectomy, or even total cystectomy, should be the procedure of choice.

It must not be forgotten, however, that the application of radium requires just the same skill and knowledge of cancer as does the application of surgery, if good results are to be obtained.

The author gives his procedure or plan of treatment with radium, using two or more 50 milligram tubes, filtered through brass and 1 millimeter of lead, spaced with a covering of gauze. This may be left in place for 36 hours. In this way, as much as five or six thousand milligram-hours may be used in the bladder.

F. B. SHELDON, M.D.

Diseases of the Tongue. H. C. Lindsay. California and Western Med., October, 1930, XXXIII, 729.

Diseases of the tongue seem to have been somewhat neglected in our textbooks on dermatology. A simpler nomenclature and more definite descriptions would help the modern student in his studies of the buccal mucous membranes and of the tongue. Standardized nomenclature did much to simplify the study of dermatology, and standardized nomenclature could also be used advantageously to clarify the study of lingual maladies. Up to the present, naming diseases after their discoverers has not been overly indulged in.

The author has found that certain cases of leukoplakia lingualis respond to X-ray treatment, but believes radium is probably handier for this work and even more efficient. He discusses some of the fallacies in diagnosis, traumatic lesions of the tongue, and other confusing diseases of the mouth.

Under "Treatment," he says: "A word as to the treatment of carcinoma of the tongue. Surgery undoubtedly has a definite value, but it seems to me that the result obtained by implants of radium seeds alone or in conjunction with surgical interference, excel in curative results those obtained by surgery alone. An interesting paper on this subject by Soiland, Costolow, and Meland appeared in the January issue of RADIOLOGY. Too much must not be expected from excision of the submental gland as an attempt to stop metastasis to the deeper cervical glands, because only some of the lymphatics from the tip of the tongue go through this gland and the channels from the posterior and middle third of the tongue do not.

"For some unexplained reason, roentgen-ray therapy does not seem to have been used much in treating diseases of the mucous membrane of the mouth. McKee expresses the belief that the mucosa will not stand X-rays well, although he states that he has not used them much for that purpose. On the other hand, Sabouraud is of the opposite opinion. I have used erythema doses of X-rays upon leukoplakia and non-malignant papillomata, with surprisingly satisfactory results. Smaller doses have greatly improved chronically inflamed and enlarged tongues, and they have been useful in reducing the hypersensitive, burning tongue which occasionally affects women during the menopause. Theoretically, X-rays should be helpful in treatment of the sensitive tongue in certain leukemic cases."

F. B. SHELDON, M.D.

Cancer of the Breast. Edmund S. Boice. Southern Med. and Surg., August, 1930, XCII, 575.

Out of a total of 19,300 admissions to the Park View Hospital during the past 15 years, there were only 39 cases of cancer of the breast, and 54 patients with benign breast tumors. Radical breast operation was done upon 28 patients, and it is expected that not more than 25 per cent of these will reach the five-year limit without recurrence. Comment is made upon the statements of the American College of Surgeons as to the effects of radiotherapy upon the mortality figures, as con-

trasted with the experience of Pfahler, Quick, Lee and others in this country, and the author concludes that "certainly if their contentions are true it would appear that if we can get more patients to the surgeon in the stage when the microscope is necessary for diagnosis, and then treat these cases with the combination of radical operation and post-operative X-rays, we may reasonably expect a decided improvement over the results obtained in the past."

W. W. WATKINS, M.D.

Intra-oral Cancer and its Treatment. Albert Soiland and Orville N. Meland. California and Western Med., August, 1930, XXXIII, 559.

One of the most difficult problems of the physician is the recognition and treatment of intra-oral cancer. Patients are ofttimes seen with late lesions, due to difficulty in diagnosis because of the many pyogenic and pathologic processes which usually complicate the cancerous disease. This complication is serious because of the early extension through the dilated lymphatics into the regional lymph nodes. The authors speak of the complication with syphilis, and the methods of treatment used in the different clinics.

The technic which they have followed is given according to location. They feel that it is essential to render certain preliminary treatment prior to the institution of any active attack on the lesion. All forms of sepsis, due to teeth, must be eliminated by thorough dental cleansing and extraction. Likewise, plates must be permanently removed. Mild mouth washes give much relief. While this clean-up is being carried out, radiation in the form of high voltage X-ray or radium packs is given to the gland-bearing areas on each side of the neck. As a result of this preliminary treatment, enlarged glands, which are frequently only the seat of septic absorption, may disappear, while the original lesion in the mouth diminishes as the accompanying inflammatory zone shrinks.

When the primary lesion is on the tongue, it is attacked by circumvallation with implants of radon, filtered through gold or platinum. Following the general rule of using 2.5 millicuries per cubic centimeter of tissue, a reaction is set up that will destroy the malignant tissue without doing much damage to the normal structures. In case of doubt, it is better to over-radiate than to under-radiate, since the chances for a good result are better from the primary application than from subsequent sessions.

Lesions of the cheek may be treated by implants, but usually surface radiation, by gamma rays, will clear up the majority of the cases. If this is insufficient, the authors resort to electrocoagulation.

What to do with the regional glands is a moot question. Theoretically, a block dissection should be the procedure, but chances for cure after actual involvement of the glands are so small, and the mortality is so high, that it is not practised as often as formerly.

In the authors' work, where they palpate one or two movable glands and when these have not disappeared under irradiation, it is their procedure to expose the gland, destroy it by coagulation *in situ*, and then to apply a radium pack. The drawback is that the resulting wound heals very slowly. However, their impression is that in the few patients in whom they have done this, the shock from the operation is small and the immediate results are favorable. On the other hand, if the glands are fixed, external irradiation alone is given, with no attempt at surgical exposure.

When glass implants were introduced, the authors' enthusiasm increased, and now that interstitial irradiation from gold and platinum seeds is used, they feel that the patients with this disease have a fair chance for recovery. At any rate, the primary lesion practically always disappears. The prognosis of the case is dependent on the secondaries. Radiation, when successful, produces little deformity and does not interfere with function if the disease is not too extensive. Where radiation is not sufficient, especially in the radioresistant lesion, electrocoagulation and electrosurgery may be used with good effect.

F. B. SHELDON, M.D.

THE CHEST (DIAGNOSIS)

The Radiologic Aspect of the Lungs and Valvular Defects of the Heart. Giovanni Balestra and Adolfo Ghio. La Radiologia Medica, June, 1930, XVII, 653.

The object of this article is the study of the relation between the diseases of the heart and the radiological appearance of the lungs. Roentgenograms of the chest do not supply sufficient factors in the diagnosis of organic affections of the heart, because they do not reveal their nature and cannot give any information as to the functional efficiency of the cardiac muscle itself. Radiologic control is considered very helpful, nevertheless, in functional defects of the left heart and mitral valves, because it may disclose evidence of pulmonary stasis which could not be noticed clinically.

The miliary shadows caused by pulmonary stasis may be sufficiently identified, especially on account of their position, to be definitely distinguished from miliary formations of tuberculous nature. Radiologic observation has, also, a special importance when the source (either pulmonary or circulatory) of hemoptysis is to be definitely ascertained.

L. MARINELLI.

Fibrinous Pneumonia, with Partial Lobar Consolidation. Manuel Viamonte. Anales de Radiologia, April, 1930, II, 61.

The author calls attention to and describes in detail an atypical modality of fibrinous pneumonia in which there is a triangular consolidation in the lower half of the right upper lobe, with the base towards the periphery. The process is found in adults and has the same roentgen characteristics as the initial period of lobar pneumonia in children, in which the consolidation is more pronounced at the periphery. These cases give a history of sudden onset, with high temperature and chills, and the illness is of short duration. The patients are not clinically ill after the crisis, even though the radiographic signs may persist. In one of the cases, total resolution did not take place until two months after the crisis. These cases are usually diagnosed as bronchitis and "grippe" because of the absence or scarcity of physical signs; hence the importance of a radiological investigation in all cases with acute respiratory symptomatology, not only to determine the nature of the affection, but also to keep these patients under proper care in the post-crisis period, while roentgenologic signs are still in evidence, so as to prevent complications. The roentgenologic differential diagnosis is at times difficult, as tuberculous caseous pneumonia, primary parenchymatous carcinomata, and acute pulmonary abscess may also give triangular densities at the lower portion of the right upper lobe, with the base towards the periphery. The clinical, as well as the roentgenographic course of the illness, however, is much different in the caseous tuberculous pneumonia, where, when the evolution is favorable, the process runs from caseous to fibrocaseous, to fibrosis, there being no restitution to normal, as it happens in the uncomplicated fibrinous pneumonia. In the carcinomata, serial roentgenography will soon demonstrate the growth of the neoplasm. Finally, in pulmonary abscess, early cavitation is the rule.

(Abstractor's note: The author fails to enumerate intralobar empyema, which also gives a triangular shadow, with the base towards the periphery—a condition which is quite uncommon in tropical countries.)

P. R. CASELLAS, M.D.

Congenital Pneumothorax: Review of the Literature and Report of a Case. Jacob Stein. Am. Jour. Dis. Child., July, 1930, XL, 89.

The author has carefully reviewed the literature and found four cases of congenital pneumothorax. He reports a fifth case. Fairly detailed reports of all five cases are given. The earliest case was diagnosed at necropsy. In all of the four remaining cases, the diagnosis was suggested on physical examination and confirmed by roentgen-ray examination.

Roentgenograms of the author's patient, a few days after birth, showed a complete absence of lung marking in the right thorax.

The mediastinum and cardiac shadows were displaced to the left, and there was an adhesion in the right costophrenic space. A number of fluoroscopic examinations were made during the following two years, with practically no change in the roentgen findings, and a roentgenogram at the end of this period confirmed the fluoroscopic findings.

Two of the five patients died, one following pneumothorax and one with a diagnosis of broncho-pneumonia. Of the three living, treatment was attempted in only one case. Withdrawal of air was carried out but the lung collapsed after aspiration.

F. B. MANDEVILLE, M.D.

The Lobus Venæ Azygos: Its Visibility on Roentgenologic Examination and its Significance for the Clinician. Gustav Velde. Fortschr. a. d. Geb. d. Röntgenstr., July, 1930, XLII, 82.

The author is of the opinion (the Abstractor thinks erroneously) that he first described this lobe as such in the roentgenologic literature. A perfectly normal interlobar septum may be demonstrated on roentgenograms of the chest. Occasionally a differentiation from tuberculosis, retrosternal thyroid, tumor, and pneumothorax must be made.

HANS A. JARRE, M.D.

The Mechanism of Physical Signs in Neoplastic and Other Diseases of the Lung, with Especial Reference to Atelectasis and Emphysema. Chevalier Jackson. Jour. Am. Med. Assn., August 30, 1930, XCV, 639.

Bronchoscopic studies demonstrated, many years ago, the mechanism of the physical signs of foreign bodies in the bronchi. The understanding of this mechanism is essential for the proper interpretation of the physical signs. Removal of the foreign body and the consequent change in the physical signs made possible a rechecking and restudy of the previous interpretations. With the knowledge gained from this study, the study of the mechanism of the signs in disease was much simplified. Bronchial obstruction is one of the fundamental factors in the etiology of pulmonary disease and in the production of physical signs.

Bronchoscopic observations have revealed three types of bronchial obstruction. Mechanically expressed they are: (1) a stop valve; (2) a check valve, and (3) a by-pass valve. In the stop-valve type, the bronchus is corked, and no air can get in or out. The residual air confined below is absorbed, and in a few hours atelectasis becomes demonstrable. After a variable period of time, drowned lung succeeds to the atelectasis because there are always at least a few organisms present in the bronchi. In the absence of lung ventilation the defensive powers of the lung are so diminished that suppuration quickly follows.

In check-valve obstruction a flow of air in only one direction may cause an obstructive atelectasis or an obstructive emphysema, according to the direction in which the valve operates. Emphysema and atelectasis may follow each other in quick succession, according to the action of the valve. The human thorax in its respiratory expansion and contraction simulates a bellows. Check-valve action in a bronchus may be of the ball-valve or the flapper-valve type.

In by-pass valve obstruction, the lumen is narrowed; air can pass in and out, but in diminished amount. The author lays stress on the "asthmatoid wheeze" heard with the ear to the patient's mouth, and rarely audible at the chest wall, as an early evidence of obstruction.

Check-valve obstruction may be produced by: (1) foreign bodies; (2) benign growths; (3) malignant growths; (4) adenopathy; (5) anomaly; (6) inflammatory mucosal swelling; (7) granulations and granulomas; (8) secretions; (9) blood clots.

Differentiation between a non-opaque foreign body and an endogenous substance acting as such can be made only by the bronchoscope.

A detailed discussion of the conditions producing valvular obstruction includes new-growths, malignant growths, adenopathy, anomaly, inflammatory mucosal swelling,

granulations and granulomas, secretions, asthma, diphtheria, and blood clots.

Atelectasis in children is so often due to bronchoscopically curable valvular obstruction that the diagnosis of other types of atelectasis should not be made without bronchoscopy.

CHARLES G. SUTHERLAND, M.D.

The Roentgenologic Appearance of Lobular Pneumonia (Bronchopneumonia). N. W. Potte. Fortschr. a. d. Geb. d. Röntgenstr., July, 1930, XLII, 69.

The great variability of atelectasis, bronchopneumonia, hypostasis, pulmonary edema, tuberculosis (miliary) is discussed, and a correlation of the pathologic and roentgenologic appearances is attempted. Emphasis is laid upon the fact that a differential diagnosis may be arrived at only by proper correlation of all the clinical and roentgenologic information, and that there may be a considerable discrepancy between the histologic findings and the gross anatomic appearance. One should not neglect frequent re-examinations in such patients, as the changes in the films may lead to a correct diagnosis.

HANS A. JARRE, M.D.

Asbestosis Bodies in Sputum and Lung. Kenneth M. Lynch and W. Atmar Smith. Jour. Am. Med. Assn., August 30, 1930, XCV, 659.

Necropsies on patients who have been workers in asbestos mills over a prolonged period show certain peculiar foreign bodies in the alveoli, bronchioles, and interstitial fibrotic areas. These have been called "asbestosis bodies." There is a peculiar characteristic in the state of asbestosis, not found in silicosis. Patients show extensive fibrosis and "golden yellow" segmented structures, with rounded ends. Asbestosis bodies have been found in the sputum of patients who have been workers in asbestos; they were not found in the sputum of others.

It remains a subject for further study as to the relation of the occurrence and duration of time of these bodies in the sputum to the extent of exposure to asbestos dust, and as to the state or stage of asbestosis or other associated conditions, in relation to their expulsion in the sputum. Asbestos bodies do not take the ordinary tissue and sputum dyes. They have been found in their natural form in a slide preparation of sputum stained by the ordinary method for tubercle bacilli.

CHARLES G. SUTHERLAND, M.D.

The Roentgen Appearance of the Chest of the New-born Infant. John T. Farrell, Jr. Am. Jour. Roentgenol. and Rad. Ther., August, 1930, XXIV, 140.

The author presents an illustrated roentgen study of 119 new-born infants, who were roentgenographed within 48 hours of birth, again ten days later, and some when six months of age. The spine of the new-born infant, in the lateral projection, does not have the familiar convex thoracic and concave lumbar curves. The sternum is seen more clearly in this view because of its form, and ofttimes presents five separate centers of ossification. The films of 96 infants were measured. The width was determined by measuring a line drawn at right-angles to the spine through the highest point of the diaphragm, and the internal measurement recorded. For the length, a second line was drawn through the center of the spine at right-angles to this first line, and the distance from the diaphragmatic line to the upper border of the first rib recorded as the length. The average thoracic width was 9 centimeters; the males were slightly larger than the females. The average length was 5 centimeters, the males again being slightly larger than the females. The transverse diameter of the heart was determined by measuring the distance it extended to the right and left by lines drawn at right-angles to the spine. It measured 5 centimeters in all cases. Four distinct conformations of the heart were noted: (1) the long narrow; (2) the broad apical, with narrow base; (3)

the broad apical, with broad base; (4) the round globular. In 30 instances the thymus was seen. Re-study at ten days of age showed no appreciable change in measurements. Re-study after a lapse of 6 months showed a similarity in the configuration of the thorax and thoracic organs to that seen in the same infant at birth.

J. E. Habbe, M.D.

Posterior Mediastinal Empyema Perforating into a Bronchus. Quintino Vischia. Archivio di Radiologia, May-June, 1930, VI, 485.

The author reports a case of probable empyema of the posterior mediastinum which had perforated a bronchus and produced expectoration of fetid pus. He also discusses the clinical and radiologic findings in such a lesion, and reviews the literature.

E. T. Leddy, M.D.

CONTRAST MEDIA

The Roentgenologic Demonstration of the Mucosa by Means of Umbrathor: A Contribution to the Roentgenologic Diagnosis of Ulcerative Colitis. H. Regelsberger. Röntgenpraxis, Oct. 1, 1930, II, 876.

The examination of the mucosa relief has added new diagnostic possibilities. A small amount of barium in the stomach, with a certain amount of compression, has been advocated by H. Berg. A perfect emulsion of barium cannot be made, which fact prohibits a uniform result. Recently a thoriumdioxyd preparation, called "Umbrathor," has been manufactured, which is a perfect colloidal emulsion. It is non-toxic and coats the mucosa in a thin, even layer. The combination of umbrathor with the instillation of air gives the best results. In demonstrating the mucosa of the colon, it offers more help than a barium enema or a barium enema combined with air inflation (A. W. Fischer). From 20 to 30 c.c. of umbrathor seems sufficient to demonstrate the mucosa of the stomach.

H. W. Hefke, M.D.

Clinical Use of "Lienography," a New Method for the Roentgenologic Demonstration of the Spleen and Liver. Mitsutomo Oka. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 892.

Intravenously injected colloids of metals, with a negative charge, are accumulated in the reticulo-endothelial organs. While a large amount of colloidal thorium injected in a single dose produces shock and death, the repeated injection of small doses is relatively harmless. Thus in animal experimentation, merely slight variations in blood counts, formation of certain immune bodies, osmotic resistance, etc., were found during short periods.

Six patients received from 0.07 to 0.15 gram of thorium-dioxyd-sol in 10 per cent solution and mixed with 10 per cent glucose, subdivided into from six to eight doses on alternating days. The spleen and later also the liver cast radiopaque shadows at examination twenty-four hours following the injections. After-effects, fever, diarrhea, etc., were either mild or absent.

Hans A. Jarre, M.D.

The Technic of the Intratracheal Injection of Iodized Oil. Jerome R. Head. Illinois Med. Jour., July, 1930, LVII, 73.

The writer uses a modification of the transglottic method of Rosenthal. Local anesthesia is unnecessary, and if the oil is heated it can be injected with an ordinary syringe through an eighteen or twenty gauge needle. The procedure is as follows: the oil, usually 20 c.c., is poured into the syringe and heated by revolving the barrel over a Bunsen or alcohol flame. With a little experience one can tell when the viscidity is sufficiently decreased. The needle is then fitted to the syringe. The patient is asked to refrain from swallowing or coughing during the injection. The cricoid

cartilage is located with the forefinger of the left hand and the needle inserted through the skin in the mid-line just at the upper border of the cricoid. This procedure is simplified if the skin is picked up and drawn away from the underlying tissues. With the needle already through the skin, the cricoid is again located with the finger and the needle pushed through the cricothyroid membrane by slipping it over the upper border of the cricoid. The accuracy of the puncture being verified by aspirating air into the syringe, the oil is injected. The needle should just enter the lumen of the trachea.

If one desires to examine a lower lobe, the patient is placed, sitting, on a chair facing the operator, leaning toward the side to be injected. If a middle or upper lobe is to be filled, injection is made while the patient lies on the affected side. To fill the upper lobe, he is tipped with the head downward, immediately after the injection. During injection in the recumbent position, it is necessary to have an assistant hold the head flexed to the upper side, so that the oil will flow downward into the lung. Ten c.c. of oil will give a satisfactory visualization of a single lobe in an adult, and five c.c. in a child.

C. H. DEWITT, M.D.

ESOPHAGUS (DIAGNOSIS)

A New Technic for the Radiological Study of the Stenotic Affections of the Esophagus. Giuliano Chizzola. La Radiologia Medica, April, 1930, XVII, 403.

The classical technic employed in the radiologic examination of the esophagus is wholly inadequate if the shape of a stenosis is to be ascertained.

The ingenuous artifice of Ledoux and Sluys accomplishes its purpose in most cases but it presents inconveniences of a practical nature. The author has devised and applied for some time, a personal method with very satisfactory results. The procedure is as follows:

First of all the location and the approximate extent of the lesion must be studied with the ordinary technic. The patient is then given the classical Rivière's potion in order to create formation of gas in his stomach. This is to be followed quickly by the administration of some viscous opaque meal, not too thick, in order that it may pass through the stenotic region. As soon as the stenosis is perceived on the screen, an additional opaque meal is given; this time it must be thick so that it may produce a lasting image on the upper limit of the lesion. In the meantime, some of the gas in the stomach will have forced its way out through the cardia and inflated the substenotic portion of the esophagus. The stenosis would thus be limited by positive and negative images.

L. MARINELLI.

Diverticula of the Thoracic Portion of the Esophagus. C. H. Heacock. Southern Med. Jour., June, 1930, XXIII, 517.

Prior to the advent of the X-ray, with one or two exceptions, diverticula of the thoracic portion of the esophagus were found only at postmortem examinations. Since 1898 nearly all the cases reported in the literature have been discovered during roentgen examination, which usually gives all the information necessary, and, frequently, even the type of diverticulum may be determined. Traction diverticula are usually more or less cone-shaped, with the bases toward the lumen. Pulsion diverticula usually have rounded or oval contours and are constricted at the bases.

One of the cases reported had multiple diverticula. Two case histories are cited.

W. W. WATKINS, M.D.

Epibronchial Diverticulum of the Esophagus in a Patient Affected by Gastric Neoplasm. Mario Muzii. La Radiologia Medica, July, 1930, XVII, 802.

The author reviews the current literature on the etiology of diverticulum of the esophagus, pointing out its clinical symptoms and describing its radiological appearance. The radiological diagnosis does not present any great difficulty, provided that the observations are car-

ried out in a certain way and with proper care. The author describes a case personally observed, in which an esophageal diverticulum did not present any clinical symptoms; the patient had, however, a gastric tumor.

L. MARINELLI.

GALL BLADDER (NORMAL AND PATHOLOGICAL)

Biliary Colic in Routine Cholecystography. Irving Gray and Milton J. Matzner. Long Island Med. Jour., August, 1930, XXIV, 440.

Following the introduction of cholecystography, the use of the fat-rich diet as a test for the functional ability of the gall bladder to empty itself has become a routine. Within the past eight months, during routine cholecystographic examination, four patients have developed pain in the right upper abdomen following the ingestion of a fat-rich diet, the attacks coming on in from fifteen to forty-five minutes. This occurrence is proof of the danger of using too high a fat diet as a routine, without individual indications. If distress should occur, even if normal cystographic findings are noted, gall-bladder disease may be strongly suspected.

W. W. WATKINS, M.D.

The Blood Supply of the Gall Bladder. Anastasia Rubascheva. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 957.

This paper presents a study of the cystic artery of the dog, the rabbit, and man by radiopaque injection, showing its great morphologic variability and the multiplicity of the arterial supply of the ductus choledochus.

H. A. JARRE, M.D.

The Effect of Acute Experimental Cholecystitis on the Emptying of the Gall Bladder. George T. Murphy. Arch. Surg., August, 1930, XXI, 300.

Acutely inflamed gall bladders were produced in ten dogs by the intravenous injection of varying amounts of eusol. The effect of the specific chemical cholecystitis on the emptying of the gall bladder was studied in a series of ten animals. Direct observations, as well as roentgenograms, were made of the diseased gall bladders following the administration of a meal rich in egg yolk and cream. Only one instance has been encountered wherein an acutely inflamed gall bladder, produced by this means, has shown any evidence of emptying. The observations appear to indicate that the acutely inflamed gall bladder does not empty after the usual test meal.

HOWARD P. DOUB, M.D.

GASTRO-INTESTINAL TRACT (DIAGNOSIS)

Segmentary Toxic Gastritis of the Antrum Pylori. Lorenzo Giuntoli. La Radiologia Medica, July, 1930, XVII, 853.

This is a report of a radiological examination of a subject who swallowed a 20 per cent solution of sulphuric acid. X-ray investigation revealed a total pyloric stenosis. At operation the surgeon could not find any other lesion and performed a simple posterior gastro-enterostomy. The author ascribes the location of the lesion to the long stay of the caustic solution in the antrum. This delay is thought to have been caused by irregular changes in peristalsis, brought about under the stimulus of an hyperacid content.

L. MARINELLI.

An Appraisal of the Motor-test-meal in the Roentgen Examination of the Stomach and Small Bowel. Alexander B. Moore. Am. Jour. Roentgenol. and Rad. Ther., May, 1930, XXIII, 503.

The three common causes of six-hour gastric retention of the barium meal are: gastric cancer, gastric ulcer, and duodenal ulcer. In a series of 950 cases examined and later operated on at the Mayo Clinic, 60 per cent of gastric cancers, 45 per cent of gastric ulcers, and 28 per cent of duodenal ulcers showed some gastric retention. Rarer organic

causes of six-hour retention are: pyloric ring ulcer, pyloric muscle hypertrophy, congenital pyloric stenosis, adhesions about the duodenum, benign pedunculated tumors, cancer or ulcer in the upper jejunum, and gastro-jejunal ulcer.

Non-organic causes of stasis are: (1) severe migraine; (2) dread of the examination; (3) habitual use of morphine; (4) tabes dorsalis; (5) irritation following gastric analysis; (6) hypotonic stomach; (7) cholecystitis; (8) chronic appendicitis, and (9) the taking of food during the six-hour interval. The author lists seven points indicating the value of a six-hour retention but offsets these with eight points arguing against its intrinsic worth and closes with a statement that since discontinuing the six-hour motor meal examination at the Mayo Clinic the accuracy of diagnosis has been slightly increased.

J. E. HABBE, M.D.

Importance of Radiological Control on Duodenal Drainage. Giuliano Chizzola. Minerva Medica, June 2, 1930, XXI, 918.

The author discusses the difficulties encountered in the correct performance of the Meltzer-Lyon test, used in the study of biliary diseases.

It is important for the physician to know the path followed by the bulb of the apparatus and its final position. Indirect evidence is to be discarded as misleading, and ordinary radiography may not be satisfactory. The author proposes a topographical localization of the bulb by injecting air through the tube into the duodenum by means of a Paquelin pump. He shows, with radiographic films, how definite information is obtained by this method, and suggests that it be adopted in routine practice because it is simple and innocuous.

L. MARINELLI.

Stenosis of the Submesocolic Portion of the Duodenum. Vito Potenza. La Radiologia Medica, June, 1930, XVII, 675.

The author has observed a submesocolic periduodenitis in a child three and a half years old. The symptoms, which had been noticed since birth, were temporarily and partially relieved by a lactic-hydro-alkaline diet.

The operative findings fully confirmed the radiological diagnosis. Peritoneal adherences in the third portion of the duodenum and superficial ligaments between the gall bladder and the lower surface of the liver were found. The patient has fully recovered following a posterior gastro-enterostomy. The radiological picture was that classically described by Holzknecht, and it was thought worth publishing because of the rarity of the anomaly and of the marked alterations revealed, and because it demonstrates the aid radiology may supply in the diagnosis of disturbances of young patients.

L. MARINELLI.

The Radiological Diagnosis of Duodenal Ulcer. Alberto Anzillotti. Minerva Medica, Sept. 8, 1930, XXI, 331.

The author replies to the criticism some writers have voiced against the use of fluoroscopy in the diagnosis of duodenal ulcer. He supports the value of the indirect factors, and considers radioscopic investigation quite sufficient in most cases.

L. MARINELLI.

The Human Constitution in its Relation to Gastro-intestinal Disorders. Julius Friedenwald. Jour. Am. Med. Assn., Sept. 27, 1930, XCV, 905.

It has now become well established that not only do internal conditions bear a direct influence in the production and the course of disease, but the inherent characteristics of the tissues of the body themselves and their resistance and reactions to these influences likewise play an important rôle in this respect.

Draper directs attention to the individual's personality, and Raymond Pearl has directed two lines of research. In Pearl's first research, a series of family records have been subjected to various forms of genetic and statistical analysis. The second approach has been through the biometric study of autopsy records.

It is quite possible that by means of a more intensive study of the human constitution certain diseases may become recognized far ear-

lier and their progress arrested before serious inroads have been made into the patient's health. The author limits his remarks to this relation with the gastro-intestinal tract.

Congenital abnormalities of the mouth, tongue, esophagus, stomach, and intestines are discussed, and attempts made to correlate roentgenologic observations with gastric motility and general physique of the individual.

Mills' study of the relation of bodily habitus to visceral form, position, tonus, and other studies are reviewed to emphasize the importance of a better understanding of the human constitution in its relation to diseases of the gastro-intestinal tract.

CHARLES G. SUTHERLAND, M.D.

The Radiological Aspects of Duodenal Mobility. Virgilio Dall'Acqua. La Radiologia Medica, July, 1930, XVII, 781.

According to the most recent statistics the occurrence of duodenal mobility is not rare, being of the order of above 0.5 of 1 per cent of all cases radiologically studied. Its detection is not always easy, and its interpretation not always exact.

The author illustrates seven cases studied in the course of a year. He distinguishes the different forms of this anomaly as follows: (1) Partial mobility, which affects only the first part of the duodenum and the beginning of the second; (2) total mobility, which involves the entire duodenal area. In the first case the duodenum presents, radiologically, an image similar to a double festoon, or else it may form a complete arc above the fixed portion of the descending tract. If the latter is free, the duodenum appears capsized, that is, open from below. This abnormality occurs when, in addition to mobility, other factors such as stretching of the hepatoduodenal ligament or ptosis of the liver are present. The diagnosis of total mobility is generally difficult. In the majority of cases, however, the duodenum appears all on one side of the vertical axis of the body, and it causes abnormal arrangement of the abdominal viscera. A case is described in which, besides duodenal mobility, there was inversion of the stomach and liver, with persistence of the mesenterium commune, and mobility of the cecum.

As for the importance this anomaly may have in abdominal pathology, it must not be forgotten that, while it may in some cases occur symptomatically, in others it may cause duodenal stenosis and compression of the bile ducts.

Gastritis, duodenitis, periduodenitis, gastric or duodenal ulcers may frequently be caused by the anomaly in question.

L. MARINELLI.

Hypertrophic Pyloric Stenosis in Adults: Roentgen Aspects. Vincent W. Archer. Am. Jour. Roentgenol. and Rad. Ther., May, 1930, XXIII, 510.

The author believes hypertrophic pyloric stenosis to be a definite disease entity, with a definite syndrome. Two explanations for the condition are, a long continued functional spasm resulting in hypertrophy of a previously normal pylorus, and an hypertrophy of the congenital type, which for years may have been overcome, with symptoms recurring later in life. The author's three cases, showing only benign hypertrophy of the pylorus, varied in age from 39 to 63, each presenting symptoms suggestive of either ulcer or carcinoma. It is believed that the hypertrophic stenosis, when marked, can be differentiated roentgenologically from simple pylorospasm by careful roentgenoscopic study, the two significant findings being a persistent unchanging increase in breadth of the pyloric ring not amenable to anti-spasmodics, and a six-hour gastric residue.

J. E. HABBE, M.D.

Diagnosis and Therapy of Acute Necrosis of the Pancreas. R. Ehrmann. Med. Klinik, Sept. 12, 1930, XXVI, No. 37, p. 1363.

The roentgenologic symptoms of an acute necrosis of the pancreas have not been thought of often enough. Slight lagging of the left diaphragm, and changes in the outline of the stomach and duodenum, which are caused by an enlarged pancreas, have been described.

The author regularly found such a change in the contour of the outline of the stomach. The duodenum may also be displaced. One may often find a rather large, soft-tissue tumor in the pancreatic region on a flat film of the abdomen, which represents the greatly enlarged, edematous pancreas. The roentgenologic examination may be of great help in such cases, in which the clinical diagnosis is often exceedingly difficult.

H. W. HEFKE, M.D.

Radiological Aid in the Study of Chronic Colitis. Antonio Gavazzeni. La Radiologia Medica, April, 1930, XVII, 433.

The author studied thirty cases of chronic colitis. He admits that this disease does not present, radiologically, any characteristic signs, but he shows, however, that in cases with ambiguous clinical symptoms the latter are not to be held negligible as aids, especially in myxomembranous and ulcerative colitis involving the mobility and morphology of the colon. Radiological study is considered valuable in the diagnosis of functional troubles. In some cases it is almost necessary in order to localize and evaluate the affection.

L. MARINELLI.

Clinical Syndromes that Include Achlorhydria. James S. McLester. Jour. Am. Med. Assn., Sept. 6, 1930, XCV, 719.

A symptom complex is frequently seen in the South that is exhibited with striking uniformity by an apparently heterogeneous group of diseases, including an anemia of variable degree, sore tongue, gastro-intestinal disturbances, cord changes perhaps, and achlorhydria. Any one or any combination of these may dominate the whole and give color to the clinical picture, but achlorhydria is the one salient feature. It signalizes the group.

This has suggested pernicious anemia, pellagra, sprue, and subacute combined sclerosis, depending on the predominant symptom. What is the meaning of the central feature of the clinical picture, the achlorhydria? The problem is complicated by the fact that this gastric deficiency may be experienced by apparently healthy persons with perfect digestion.

In Castle's discovery that muscle meats which have been partially digested in the normal stomach and then regurgitated will, when fed to a patient with pernicious anemia, bring about the same blood regeneration and amelioration of symptoms as would a diet of liver, an entirely new light is thrown on the problem.

Pernicious anemia (and probably sprue) is a deficiency disease due to the lack of two substances, an intrinsic and an extrinsic factor. Evidently the intrinsic factor is formed in the normal stomach. The extrinsic factor is probably a nitrogenous base, which can be produced from beef muscle through the action of the intrinsic factor.

A review of eight cases follows, and the author points out that the difficulty of categorically labeling these patients illustrates the possible kinship between the diseases of this group.

CHARLES G. SUTHERLAND, M.D.

Diagnosis of the Nature of Benign Growths of the Stomach. Alberto Anzillotti. La Radiologia Medica, April, 1930, XVII, 455.

This is a report on three radiological observations of benign growths of the stomach. These neoplasms are very rare and it is often impossible to formulate a differential diagnosis, especially in stenotic cases presenting gastric ectasy (myoma of the pylorus).

The observations reported by the author were a myoma of the antrum pylori, a circular myoma of the pylorum, and a movable polypus of the stomach.

L. MARINELLI.

The Roentgen Diagnosis of Inflammatory Lesions of the Colon and Their Differentiation from Carcinomas. H. Pansdorf. Röntgenpraxis, August 15, 1930, II, 732.

The roentgen examination of the colon allows us to-day to almost always make a differential diagnosis between inflammatory and malignant processes of the colon. Any

one of the three methods of colon examination, namely, the barium enema, the examination of the "mucosa-relief" with a collapsed colon, and the combination of barium and air-inflation is by itself not always sufficient to make a definite diagnosis. In practice, one should first examine the colon distended by a barium enema. After emptying, one may study the mucosa and finish with inflating the colon with air, according to A. W. Fischer's technic. A definite differential diagnosis in the greatest number of cases may then be established.

H. W. HEFKE, M.D.

The Alimentary Tract in Flajani-Basedow's Disease. Pietro Ottonello. Rivista di Radiologia e Fisica Medica, August, 1930, II, 401.

In the X-ray examination of the gastro-intestinal tract of six patients with Flajani-Basedow's disease, the author noted an unusually rapid passage of the opaque meal, and insufficiency of the normal sphincters of the gut. He believes the cause is an excitation of the fibers of the vegetative nervous system by toxic substances from the thyroid, and on this basis he explains the marked loss of weight common in patients with this disease. In the presence of similar radiologic findings not explained by other facts, Ottonello is of the opinion that one should suspect an unrecognized case of Basedow's disease.

E. T. LEDDY, M.D.

Evaluation of the X-ray Examination in Duodenal Ulcer. Charles D. Enfield. Am. Jour. Surg., September, 1930, IX, 465.

The author considers the question of etiology at length, and admits that there is no definite knowledge of a constant etiological factor, and there may be an underlying ulcer diathesis, the nature of which is as yet quite unknown.

He considers the various signs and symptoms of duodenal ulcer, and concludes that the X-ray diagnosis of duodenal ulcer is as nearly accurate as any diagnostic measure, when done by a competent and experienced radiologist. Inasmuch as duodenal ulcer practically always occurs in the bulb, it follows that if the radiologist can satisfy himself that the bulb is of normal contour, ulcer may be excluded from the duodenum.

Spasm of the duodenal cap is often the most conspicuous part of the deformity, and to a considerable degree is a measure of the activity of the ulcer. The author believes that frequently the duodenum must be opened at the operating table in order to verify the roentgenologic diagnosis, as the surgeon cannot be sure by palpating the duodenal cap externally.

Formerly most of the roentgenologic diagnoses were based on the indirect signs, consisting of enlarged stomach, hypertonus, hyperperistalsis, and a considerable six-hour residue, coupled with inability to visualize a normal duodenal bulb, but of late the cases are being seen earlier and the diagnosis is made to a large extent on simple deformity of the duodenal bulb.

HOWARD P. DOUB, M.D.

Colon Studies: VI.—Cecal Stasis: Its Clinical Significance and Relation to Proximal Colon Stasis. John L. Kantor, Samuel Schechter, and Jerome A. Marks. Am. Jour. Roentgenol. and Rad. Ther., July, 1930, XXIV, 1.

The authors define the various types of cecal and cecocolic stasis and non-stasis as follows: (1) Cecal and cecocolic non-stasis shows no "pocketing" at any time and the proximal colon is entirely empty within 48 hours after the ingestion of the barium meal; (2) cecal stasis shows cecal residue for at least 48 hours after the barium meal, with the adjacent colon empty; (3) 24-hour cecal stasis shows a residue persisting in the cecum for 24 hours only, with the adjacent colon empty; (4) secondary cecocolic stasis shows the cecocolon and also the transverse colon filled at 48 hours; (5) primary cecocolic stasis shows the cecocolon filled at 48 hours, but the transverse and distal colon empty; (6) 24-hour primary cecocolic stasis shows a 24-hour residue, with the transverse and distal colon empty.

Cecal and cecocolic stasis have been attributed to various causes, included in which

are pericolic, pericecal, hepatocolic adhesions, kinks or spasms of the hepatic flexure, ptosis of the transverse colon, intrinsic obstructive lesions, and exaggerated antiperistalsis.

While the absorption of toxins is considered as a possible explanation of symptoms, such as headache, vomiting, and a dragging sensation in the right lower abdomen, the authors lean toward the possibility of transient duodenal block from intermittent drag by the elongated cecocolon as a causative factor, particularly since symptoms are nearly twice as frequent in the low cecal group.

The incidence of cecal stasis was 27 per cent in 959 gastro-intestinal examinations, and the incidence was slightly higher in those upon whom an appendectomy had been performed. Cecocolic stasis was much less frequent, it being only 10 per cent when associated with constipation, and only 1 per cent when occurring alone. Both cecal and cecocolic stasis are in themselves of relatively minor importance, although in cases with low cecal symptoms they are much more common.

J. E. Habbe, M.D.

The Roentgenologic Appearance of Diverticula of the Duodenum and of Structures Resembling Such Diverticuloids. Robert Sandera. Fortschr. a. d. Geb. d. Röntgenstr., July, 1930, XLII, 54.

There is no characteristic picture differentiating between true and false diverticula of the duodenum. Forssell's six points may be applied to both types, with a varying degree of accuracy. While a distinction between true and false diverticula cannot always be made, it may often be detected from careful roentgenologic exploration. The clinical picture of either type is not characteristic, as the types vary greatly with the location, the degree of stasis and accompanying obstruction, and the involvement of adjacent organs.

The paper is illustrated by the presentation of several cases, discussed in detail, as follows: Cholecystoduodenostomy; diverticulum simulated by traction of adhesions, and an intestinal loop projecting near the duodeno-jejunal junction; two true diverticula; one ectatic lateral recess of the bulb.

Hans A. Jarre, M.D.

Roentgen Evidence of Adhesions of the Small Intestine. Horace W. Soper and J. William Thompson. Am. Jour. Surg., August, 1930, IX, 243.

The authors divide adhesions into three classes: (1) The usual adhesions that follow appendectomy. In this type the coils of the terminal ileum are matted together, but usually produce no symptoms. (2) One or more bands are formed which attach a coil of the gut to some neighboring organ or to the abdominal wall. This type may produce no symptoms, but it forms a trap that may catch a loop of the bowel and produce acute obstruction. A careful X-ray examination will often find atypical dilated coils. (3) These adhesions form definite bands which bind down the intestine and form a partial stenosis of the lumen and interfere with function. This type is more easily demonstrated by roentgen examination. The symptoms are usually dull pain located in the region of the constriction, intermittent in character, often nausea, and anorexia. A history of partial attacks of obstruction is usually obtained.

Howard P. Doub, M.D.

Concerning my Method for the Screen Examination of the Duodenum. Nándor Ratkóczi. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 941.

The author emphasizes the advisability of visualizing the duodenal bulb in almost dextrosinistral position, while the stomach is displaced by a long distinctor spoon.

Hans A. Jarre, M.D.

Duodenal Fistula. John J. Gilbride. Jour. Am. Med. Assn., July 26, 1930, XCV, 259.

Two forms of fistula have been described, namely, an external and an internal duodenal fistula, the external being the more frequent. The internal duodenal fistula may occur between the duodenum and other abdominal

viscera. Rupture of the duodenum by indirect violence inflicted on the abdomen may result in a fistula; such is not a true internal fistula.

External duodenal fistula is caused by injury to the duodenum during the performance of surgical operations. Injury to the duodenum may occur during operation on the duodenum, the pyloric end of the stomach, the gall bladder, the liver, the hepatic flexure of the colon, or the right kidney. The injury is rarely recognized at the time of its occurrence, becoming apparent one to four days later. The fistula has made its appearance as late as ten days after operation (one such case is reported). The mortality rate ranges from 75 to 25 per cent. The difference in mortality is caused by the widely different characters of the duodenal secretion in respective groups. A higher rate prevails in cases associated with an active functioning duodenum, the duodenal and pancreatic secretions having a destructive effect on the tissues locally. The loss of these secretions and their component elements to the body is even more important.

CHARLES G. SUTHERLAND, M.D.

Multiple Adenopapillomata of the Stomach, with Report of Case Showing Varying Degrees of Malignancy. F. D. Ackman. Canadian Med. Assn. Jour., September, 1930, XXIII, 391.

Multiple polypoid adenomata of the stomach were first diagnosed clinically in 1909, although they had been recognized at postmortem examination prior to that time. Since 1909, 39 proved cases have been reported, of which only 15 have been found on postmortem examination. Of the remaining 24 cases, 10 were diagnosed at operation, 9 by roentgenography, 3 by finding tumor tissue in the gastric washings, and 2 by gastroscopy. All of the 9 X-ray diagnoses have been made since 1919, when Balfour reported the first case to be diagnosed by this method. Of all methods of diagnosis the X-ray should be stressed, although the greatest difficulty is found with the borderline cases.

Treatment of the condition should be surgical on account of the danger of malignancy. Partial resection of the stomach is the operation of choice.

A typically difficult case is reported from the author's service in the Montreal General Hospital. The only clinical symptom had been a severe hematemesis.

The X-ray report of Dr. Ritchie is as follows: "There is evidence of a constant filling defect in the greater curvature in the pars media, and towards the pyloric end of the stomach. There is some widening of the pyloric orifice, and in the cap of the duodenum there is an irregular filling. This latter condition is very suggestive of a papilloma which has passed through the pyloric orifice into the duodenum. There is no definite evidence of disease of the cap itself. The filling defect on the greater curvature, while suggestive of a malignant growth, might be due to a similar condition to that seen in the cap. However, the weight of evidence is more in favor of the former."

At operation a partial gastrectomy was done, and the recovery was uneventful. The post-operative diagnosis was multiple papillomata of the stomach, which had become malignant. One small polypus had extruded through the pyloric ring into the duodenum.

L. J. CARTER, M.D.

A Case of Ileocolic Mesenterium Commune, without Rotation. Giuseppe Sighinolfi. La Radiologia Medica, June, 1930, XVII, 734.

The author reviews briefly the most modern embryological theories on the normal development of Toldt's umbilical ansa, and on the pathogeny of intestinal rotation. He illustrates, using the iconographic material of Dott, the different embryogenetic periods, and the complex errors of evolutive impulses. He emphasizes the anatomic and clinico-radiological importance of the above-mentioned ontogenetic conceptions and describes, furthermore, the radiological observations in a case of ileocolic mesenterium commune which did not present rotation.

The pathogenesis of the gastro-intestinal syndrome offered by the patient is interpreted by the author on the grounds of a strict cor-

relation between morphologic anomaly and vagotonic system, having a purely functional origin.

L. MARINELLI.

GENITO-URINARY TRACT (DIAGNOSIS)

Uroselectan in Intravenous Urography. Joseph Welfeld and Davis H. Pardoll. Illinois Med. Jour., September, 1930, LVIII, 179.

This organic iodine compound has a selective affinity for the urinary tract, is non-irritating, and in normally functioning kidneys nearly 100 per cent is excreted at the end of 8 hours, the maximum concentration occurring about 30 minutes after the injection, and the greater amount being excreted during the first two hours.

The following dosage is recommended: Infants and young children: 20 c.c. of a 40 per cent solution. Children up to 6 years: 40 c.c. of a 40 per cent solution. Children up to 12 years: 60 c.c. of a 40 per cent solution. Adults: 100 c.c. of a 40 per cent solution.

Successful urography with uroselectan depends upon the ability of the renal parenchyma to excrete it. Visualization of the kidneys, ureters, and bladder is satisfactorily accomplished when the kidneys are able to excrete the drug.

In general, the contra-indications to the use of uroselectan are those of impaired renal function, and the following conditions are given: (1) hypoplasia; (2) advanced renal tumor; (3) pyonephrosis; (4) nephritis and severe nephrosis; (5) severely infected occluded kidney; (6) complete urinary retention; (7) severe cardiac insufficiency; (8) prostatic hypertrophy, with severe degree of infection and retention; (9) where instrumentation or medication is desirable, as well as interpretation of function and pyelography.

The writers find it unnecessary to divide the dose if 15 to 30 minutes are allowed for the injection.

In conclusion, the authors summarize as follows: "We wish to state that we believe uroselectan to be a marked advance in the armamentarium of urologists for aiding diagnosis in certain selected cases, but hardly feel that the future of urology will be relegated to the X-ray laboratory, nor that the procedure of pyelography has become so difficult that the introduction of uroselectan will automatically displace direct pyelo-ureterography."

C. H. DEWITT, M.D.

The Pyelographic Image after the Injection of Uroselectan. Luigi Turano. Archivio di Radiologia, May-June, 1930, VI, 503.

The author reports ten cases studied by this new method, points out its advantages, shows that a scrupulously careful technic is necessary in its use, and believes that by this method valuable data on the morphologic relationships of the urinary tract may be obtained.

E. T. LEDDY, M.D.

Examination of the Urinary Ducts, with a New Substance Intravenously Injected. Dino Tartagli. La Radiologia Medica, July, 1930, XVII, 781.

This is a study of the efficacy of uroselectan in pyelography. The author explains the technic followed in preparing the solution, in administering it, and in taking radiographs. He compares this method with others already practised, and expresses himself very favorable to its use.

L. MARINELLI.

Intravenous Urography. Fletcher H. Colby. New England Jour. Med., Sept. 4, 1930, CCIII, 470.

Visualization of the urinary tract by means of intravenous injection has become an established procedure. The administration and dosage of uroselectan are simple. Forty grams of the drug are dissolved in 100 c.c. of redistilled water, filtered and sterilized; the entire amount is injected slowly into a forearm vein. Children and infants are given correspondingly smaller doses. The drug is of low toxicity, and since 90 per cent of it is

eliminated by the kidneys, the amount recovered in the urine in a given length of time can serve as a functional kidney test. With good kidney function, from 15 to 16 grams of iodine will be eliminated in the first two hours after injection. The method should not replace the usual pyelography but can be used in cases in which, for various reasons, it is not possible to use cystoscopy, or in which obstruction prevents the introduction of the pyelographic medium, or the instrumental method is risky for the patient, or in cases in which we do not wish to use pyelography and can obtain sufficient information by means of the intravenous method.

W. W. WATKINS, M.D.

Anomalies of the Genito-urinary Tract. A. C. Abbott. Canadian Med. Assn. Jour., August, 1930, XXIII, 217.

Twenty case histories are presented, illustrating the various types of genito-urinary abnormalities. They are well illustrated by drawings and reproductions of radiographs.

The cases described embrace solitary cysts of the kidney (large as a football), unilateral absence of a kidney, simple displacement of a kidney on its correct side, floating kidney, renal vessel abnormalities, double ureter, persistent urachus, extroversion of the bladder, congenital obstruction of the urethra, either by epithelial occlusion of the meatus or by congenital valves in the posterior urethra.

L. J. CARTER, M.D.

Intravenous Urography in the Diagnosis of Urological Diseases of Childhood. Abraham Hyman. Surg., Gynec. and Obst., September, 1930, LI, 409.

Since visualization with uroselectan depends upon the functional activity of the kidney, we have a roentgenologic functional test. The kidney shadow itself is intensified. Lack of visualization may mean non-functioning kidney, temporary inhibition, or absence of the organ. Normally, 95 per cent of the substance should be excreted within 8 hours, about three-fifths during the first 2 hours, one-quarter during the next hour, and the remainder in another 4 hours. In diseased or damaged kidneys, the rate of excretion is proportionately decreased, and the substance has been found in the urine as late as 6 or 8 days after the injection. The specific gravity of the urine in normal kidneys is greatly increased, often reaching as high as 1040 or 1045 within a few hours after injection.

The technic of administration is very simple. A child of 7 years of age receives one-half the adult dose (which is 40 grams), and a patient of 2 years one-quarter of the dose. The youngest injected in the author's series was an infant of 6 months.

In renal neoplasms in children, in which the entire kidney is often destroyed by tumor tissue, there is very little or no visualization, but where there is a definite palpable tumor on one side, cystoscopy may be dispensed with if the other kidney visualizes normally.

In 22 children injected, reliable diagnostic data were obtained in most cases by intravenous urography alone, and were of particular service in 4 cases in which, on account of severe cystitis, the ureters could not be visualized.

The author states that his experience would seem to indicate, when there is good visualization, the kidneys are probably functioning normally.

D. S. CHILDS, M.D.

Diverticula of the Urinary Bladder in Women: Report of Cases. Jay J. Crane. California and Western Med., August, 1930, XXXIII, 572.

In the many cases of diverticula of the urinary bladder reported since the advent of the cystoscope and the improved X-ray technic, this condition in women is comparatively rare, comprising about 5 per cent of all the cases. The author reports four cases.

Under diagnosis he says: "Most diverticula are found during the process of a routine urological examination. This was true in our four cases in women. We were searching for the cause of their symptoms when the orifices of the diverticula were seen with the cystoscope. Cystoscopic examination will

usually reveal the presence of a diverticulum, but it alone cannot tell the whole story. An opaque catheter curled in a diverticulum, a cystogram, and a contrast cystogram taken in more than one plane will give an accurate idea of the size, exact location, number, and whether or not they are in a position to drain freely."

F. B. Sheldon, M.D.

Intravenous Urography. Herman L. Kretschmer. Surg., Gynec. and Obst., September, 1930, LI, 404.

The author states that uroselectan is nontoxic, non-irritating, without local reactions or local pain, except in one or two instances, but these were without systemic reactions such as chills and fever. Some of the patients complained of thirst and a sense of warmth which were transitory and disappeared rapidly. Congenital anomalies were easily demonstrated, bifid pelves readily shown, and in one case a solitary kidney with a stone was shown, which was verified by operation. In one case of polycystic disease of the kidneys, the intravenous pyelograms were not as clear-cut as were the pyelograms made with ureteral catheters from below.

The best—that is the most easily readable—pyelograms and ureterograms were in cases of hydronephroses and hydro-ureters. In cases of unilateral involvement the affected side stood out in marked contrast to the normal side.

In the presence of renal and ureteral calculi, the intensity of the shadow was sometimes increased by the drug. The use of the drug demonstrated the presence or absence of complete obstruction with stone—an aid in determining an immediate operation. Failure to show the outlines of the ureters when there was fluid in the pelvis of the kidney and in the bladder was due to the absence of obstruction and normal, or possibly hyperactive, ureteral peristalsis. Because of the rapid elimination of the drug and its collection in the bladder, it is advisable to drain the bladder with a catheter in those cases in which study is directed toward the lower end of the ureter. The rapid disappearance of dilatation of the ureter following the passage of stones and also following dilatation of strictures can be satisfactorily shown by means of the drug.

In renal tuberculosis satisfactory results are obtained where ureteral catheterization is impossible. In malignant tumors of the kidney, filling defects have been shown. If great destruction of kidney tissue has occurred, the intravenous pyelograms are not so clearly defined as in pyelograms made from below. This method may serve as a check on retrograde pyelograms.

Uroselectan has been used as a medium for making pyelograms from below, diluting the standard solution with equal parts of water, giving films that are beautifully clear-cut. The drug is non-irritating and there results practically no reaction from its use in this way.

D. S. Childs, M.D.

Concerning the Roentgenologic Demonstration of the Kidneys and Urinary Passages by Intravenous Injection of Uroselectan. Karl Hutter and Max Sgalitzer. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 919.

This method was used on 110 patients between 14 and 76 years of age. The fact is repeated that besides anatomic information of importance, some knowledge regarding the functional ability of the renal parenchyma may be obtained. Illustrations show not only the value of the method in comparison and beyond that of retrograde pyelography, but also that at times the combination of both is necessary for a complete diagnosis. It is stated that in some cases of stasis one need employ only a fraction of the normal dose to obtain visualization. The necessity of individualizing roentgenographic procedure is stressed. This method was of importance in a case of renal tumor, which did not communicate with the pelvis and was not demonstrable by retrograde pyelography, but in

which intravenous pyelography revealed the area of destruction in the parenchyma.

HANS A. JARRE, M.D.

Intravenous Urography. J. Sturdivant Read and Fedor L. Senger. Long Island Med. Jour., September, 1930, XXIV, 469.

Uroselectan is easily prepared for use, 40 grams being given in 100 c.c. of water. The procedure is as simple as any other intravenous injection. The only subjective symptoms noticed are slight flushing of the face and some increase in the pulse rate, which soon disappear; in two hours most patients can resume their activities. Visualization of the kidneys, ureters, and bladder (by means of radiography) begins within five minutes of the completion of the injection, and usually three films, at half-hour intervals, will give sufficient information on which to base an opinion. The procedure by no means supplants cystoscopy and retrograde pyelography. Its special uses and indications are: (1) When for technical, anatomical, or pathological reasons cystoscopy and catheterization of the ureters cannot be performed; (2) when cystoscopy is contra-indicated due to risk of shock, etc.; (3) when the ureter is obstructed and the iodide cannot be injected beyond the obstruction.

W. W. WATKINS, M.D.

Intravenous Demonstration of the Morphologically and Functionally Normal Urinary Apparatus. Josef Palugyay. Wien. klin. Wchnschr., Aug. 7, 1930, XLIII, No. 32, p. 999.

The roentgen findings after intravenous administration of uroselectan are different from the findings in a retrograde pyelogram. The intravenous method was used with a normal urinary tract, in forty individuals. Peristaltic waves in the ureter and contraction of the kidney pelvis change the picture considerably from the one which is seen when a contrast medium is injected with pressure by means of a catheter. The kidney pelvis and the ureters become the more distinct, the greater the filling of the bladder. For their demonstration it seems better to examine after the fluid intake has been restricted for some hours. Only changes in the configuration and not irregularities in the intensity of the parenchymal shadow should be considered pathological. Indistinct contours of the pelvis and calices are not abnormal; neither is the absence of some or all calices, as this may be caused by contraction. A ureteral shadow, continuous in its whole course or a great distance of it, points to a disturbed motility of the ureter.

Further observation of normal cases seems necessary, in the author's opinion, before optimal results may be achieved with this method.

H. W. HEFKE, M.D.

Birth Traumatism as a Factor in Urinary Infection. Frank S. Patch. Canadian Med. Assn. Jour., September, 1930, XXIII, 381.

Two sequelæ of traumatism to maternal parts during parturition are cystocele and uterine prolapse. These so affect the bladder as to bring about in many cases an infection of the urinary tract. Cystocele is characterized by a sagging of the pelvic floor; thus there is formed a pouch, which, being lower than the fixed trigone, does not empty. This residual urine predisposes to infection, as does stasis anywhere.

In the diagnosis of urinary infection in the female, it is necessary to make a vaginal examination and look for any obstructive condition, such as cystocele. Residual urine should be detected and measured by the use of the catheter.

The method of cystography has recently been applied to the demonstration of bladder prolapse in the Urological and Gynecological Departments of the Montreal General Hospital. Cystograms are taken in the upright and the recumbent positions to show the comparison between the location of the bladder in the two positions.

Treatment of urinary infection, secondary to cystocele, consists in supporting the bladder in as nearly normal a position as pos-

sible, either by a pessary or by operation. If operation is done it should be only after acute inflammation has subsided. The essential feature of the operation is that permanent support should be given to the bladder floor, or that the bladder should be held in the normal position and in such a way as to give free and unimpeded urinary flow.

L. J. CARTER, M.D.

Intravenous Pyelography. Albert Laroche. Canadian Med. Assn. Jour., September, 1930, XXIII, 414.

The author briefly indicates the steps which led to the discovery of the possibility of visualizing the urinary tract by radiography, following the intravenous injection of some substance opaque to the X-ray. Following the intravenous injection of uroselectan, the author claims for "descending pyelography" all that can be accomplished by the cystoscope, the ureteral catheter, and the subsequent opaque injection, fulfilling the indications that ascending pyelography can meet. Furthermore, he claims for this new method that it enables one to determine the duration and power of evacuation of the kidney pelvis, the motor activity and permeability of the ureter, the diagnosis of diverticula, neoplasms, calculi, and the comparative functional capacity of the two kidneys. In addition, it can be used in many cases in which it is not possible to use the cystoscope and the ureteral catheter, such as contracted bladders and ureteral obstruction.

The author makes the rather startling claim that this recently introduced method should replace the cystoscope.

L. J. CARTER, M.D.

Intravenous Urography (Editorial). William F. Braasch. Surg., Gynec. and Obst., September, 1930, LI, 421.

After discussing the previous history of intravenous urography, the author makes the following comments: "A combination of iodine in high concentration with a pyridine ring had been discovered previously by Binz and Raeth of Berlin; this was called 'selectan-neutral,' and was being employed intravenously as an antiseptic. Among the first to work with this solution was Hryntschak, who as early as 1927 employed it to outline the urinary tract in animals, but was unable clearly to demonstrate its feasibility for general use. Swick, a fellow on the Libman Foundation, working with Lichtwitz at Altona, recognized early in 1929 the value of the selectan group in outlining the urinary tract following intravenous injection. However, it proved to be toxic in some cases and the shadow of the renal pelvis was frequently uncertain. Working with von Lichtenberg and Swick, Binz made various modifications which obviated the objectionable features, leaving a substance which on intravenous injection was not toxic and which outlined the pelvis and ureter sufficiently to permit interpretation of an existing abnormality. This substance was called 'uroselectan.' With characteristic Teutonic thoroughness von Lichtenberg insisted on an exhaustive trial by a group of representative American urologists before uroselectan should be distributed for general use; their results were submitted at a recent meeting of the American Urological Association.

"Uroselectan is now available for use by the medical profession and undoubtedly will prove to be a valuable adjunct to general diagnosis. Judging from the experience of those who have employed it, its greatest value probably will be in determining the condition of the kidneys in cases in which ureteral catheterization is difficult or impossible. This would include intolerant patients; patients with contracted tuberculous bladder, anatomical obstruction of the ureter, extensive vesical neoplasm, prostatic obstruction, impassable stricture of the urethra; patients who have undergone rectal implantation of the ureters; infants and patients in whom introduction of the cystoscope is difficult because of deformities. The intravenous method permits bilateral pyelography without any of the dangers accompanying bilateral retrograde pyelography; this should be of particular value in the presence of polycystic kidney, bilateral hydronephrosis, and fused and solitary kidney. It will also be a valuable adjunct to the list

of tests of differential renal function, which frequently have left doubt as to the functional capacity of the kidney under investigation. Incidentally, uroselectan offers a much better medium for retrograde pyelograms than sodium iodide in that it has none of the irritating qualities of the latter, and, because of the large content of iodine, it casts a dense shadow.

"Although the method of intravenous urography is now available to the general profession, it must be remembered that the interpretation of the urogram is frequently difficult and should be referred to those who have had extensive experience.

"It should be emphasized, moreover, that although in some cases the use of uroselectan may render cystoscopic examination unnecessary, nevertheless its interpretation will often have to be accompanied by cystoscopic data in order to complete the diagnosis.

"It will be found that the outline of the pelvis and calices is not always distinct in the urogram obtained by intravenous injection and that minor evidence of abnormality, such as occurs with renal tumor and renal tuberculosis, is easily overlooked. In doubtful cases a retrograde urogram will be necessary.

"Thus, by the work of various contributors, intravenous urography has now been placed on a practical basis. That it will prove to be a valuable adjunct to urologic as well as to general abdominal diagnosis and surgery is evident."

D. S. Childs, M.D.

GYNECOLOGY AND OBSTETRICS

Histological Study on the Effects of X-rays on the Ovary during the Period of Oögenesis. Georges Gricouroff. Radiophysiologie et Radiotherapie, 1930, Vol. II, Fasc. I, 1.

This is a lengthy and detailed account of an experimental study upon this subject. The author points out that in previous work on the effects of X-rays on the ovary recorded in the literature, adult animals, usually rabbits, were used. It is well known that in these animals the function of oögenesis ceases before puberty, and most previous work, therefore, relates to the effects of the rays upon the mature ovary. The author used in his experiments young pre-pubescent rabbits. The irradiation technic was the same in all the experiments, the conditions being as follows: Secondary voltage 150,000, filter 4 mm. aluminium, anticathode-skin distance 26 cm., duration of exposure from 20 to 28 minutes. The dosage under these conditions worked out at from 4,500 to 5,000 Solomon r-units, and a single abdomino-pelvic field was employed. It was found that the ovary, when in an active condition of oögenesis, could be totally destroyed by a single application of X-rays, using the above technic. The earliest effect, observed one hour after the irradiation, was the cessation of karyokinetic activity in both the connective tissue and epithelial cells. The individual elements in the developmental chain of the sexual cell showed different degrees of sensitivity, the oögonia being the most sensitive and the mature oöcytes the least. The follicular cells, although not distinguishable histologically from the oögonia, were found to be relatively insensitive. There is, accordingly, a radiophysiological parallelism between the homologous stages in the development of the male and female sexual cells, the germinal cells in both cases (spermatogonia and oögonia) showing a high degree of sensitivity. The vascular endothelium, both of the capillaries and the larger vessels, appeared to be unaltered. Marked, though very temporary, changes were also observed in the epithelium of the fallopian tubes.

Walter M. Levitt, M.B., D.M.R.E.

Temporary Amenorrhea in the Treatment of Endometrial Tumors of Ovarium and Peritoneum. Hans Albrecht. Strahlentherapie, 1930, XXXVII, 584.

The history of four women is related who were suffering from extensive endometrial ovarial hematomas, combined with more-or-less advanced involvement of the rectovaginal septum. They were treated by temporary

roentgen amenorrhea, with excellent results. It is suggested, therefore, that this treatment be given preference in suitable cases.

ERNST A. POHLE, M.D., PH.D.

The Clinic of Temporary Roentgen Amenorrhea. C. J. Gauss. Strahlentherapie, 1930, XXXVII, 511.

This excellent article presents the problem of temporary roentgen amenorrhea in a complete, concise manner. Following a brief discussion of the nomenclature and the history, the dosage methods are summarized. The single treatment method seems to be preferable, and the dose should be measured in the vagina during the treatment. The author then analyzes the relations between the time of the treatment and the beginning of the amenorrhea, as well as those between dose and duration. Among the clinical symptoms there were vasomotor and nervous disturbances but very little change in the sexual life and no trophic changes (increase in weight, atrophy of vulva, vagina, and uterus) as observed in permanent amenorrhea. The menstruation is usually normal after its return. The author does not consider the presence of diabetes, severe heart lesions, tuberculosis, and similar disease in young women, as justifiable indications for temporary roentgen amenorrhea, because the prevention of conception can not be guaranteed. If the menstruation as such aggravates an existing disease, temporary amenorrhea has often brought about relief. In cases of menorrhagia, it should be carried out only as a last resort; the same holds true of severe dysmenorrhea. In uterine fibroids in young women, it may be used to advantage.

Very interesting also are the good results reported by several authors in cases of endometrioma. Pelvic inflammatory diseases, both of gonorrheal and tuberculous etiology, are greatly improved by temporary sterilization. As to the contra-indications, it is stated that not all authors agree with Wintz, who does not accept any contra-indications. It certainly should not be carried out merely for the purpose of preventing conception over a limited period of time. The dangers connected with the treatment are the same as for any other roentgen exposure. In view of the relatively small dose required, no severe skin reactions should occur. A more serious possibility is the chance of producing permanent amenorrhea. Only careful measuring of the dose applied can reduce this chance. According to Wintz, only 4 per cent of all women under 35 years responded with permanent amenorrhea, following treatment for a temporary sterilization. The question of a possible tendency to abortion can not be definitely decided. The injuries to the offspring really do not belong to the dangers of temporary sterilization, since only the accidental irradiation of an embryo within the uterus may lead to abnormalities. Numerous tables compiling the cases of children born to irradiated mothers and their further histories are then summarized by the author.

In conclusion, it is stated that the danger of injury to the offspring exists during the entire pregnancy, if the uterus is irradiated directly. The injury to the germ plasma depends on the time of irradiation. If treatment for temporary amenorrhea is carried out and impregnation of the ovum takes place before the beginning of the amenorrhea, the developing pregnancy should be interrupted. A so-called "late injury" has not been proved so far. This refers to women who became pregnant after the resumption of the menstruation. The author uses temporary sterilization by roentgen rays in his clinic only in women who in all probability would not become pregnant any more, and in women to whom no other treatment procures relief.

ERNST A. POHLE, M.D., PH.D.